4.4 HYDROLOGY AND WATER QUALITY

4.4 HYDROLOGY AND WATER QUALITY

INTRODUCTION

This section comparatively examines potential impacts on hydrology and water quality associated with implementation of the OCMP and the project alternatives. The main issues addressed in the section are:

- potential impacts to groundwater levels, and the rate and direction of groundwater flow;
- potential degradation of water quality after reclamation;
- potential loss of water from aquifer storage due to evaporation;
- potential impacts associated with groundwater recharge;
- potential impacts from flooding related to potential dam failure;
- potential impacts associated with inundation of dry pits or lowered reclaimed surfaces by high groundwater conditions; and
- potential impacts associated with mercury in sand and gravel deposits.

The following summary of hydrology and water quality issues is derived from the extensive hydrologic data collected and documented in reports prepared on the hydrology of the Cache Creek basin. The model of the hydrologic cycle (Figure 4.4-1) is used as a framework for presenting this information. In a simplified manner, the model of the hydrologic cycle demonstrates how water continuously moves through the environment. The cycle encompasses numerous hydrologic processes that can be impacted by the activities of society. Each major process within the cycle is discussed with regard to the potential for the proposed project to affect the movement or quality of water within that process.

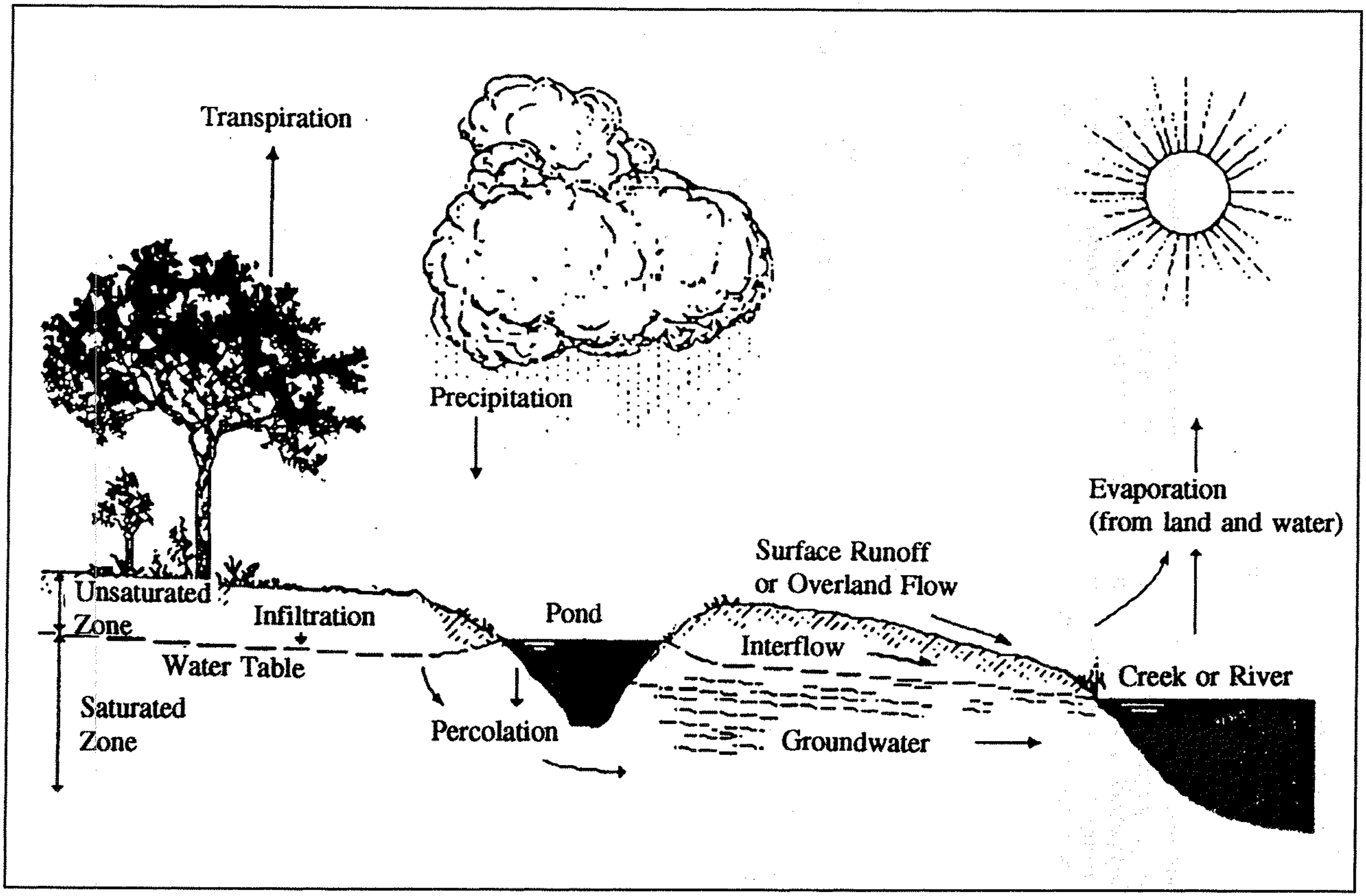
SETTING

Description of Regional Environment

<u>Climate</u>

The climate in the vicinity of the planning area is characterized as Mediterranean; warm to hot dry summers and moist winters. The orographic[1] effects of the Coast Ranges greatly influence rainfall distribution patterns in the area. Most of the precipitation in the region results from storms that originate over the Pacific Ocean and travel eastward over the Coast Ranges to the Sacramento Valley. Much more rain typically falls on the foothills

[1] The physical geography of mountains and mountain ranges.



Note: The hydrologic cycle is the cycle through which water passes from open water bodies through evaporation to the atmosphere, to precipitation, to infiltration and runoff and return to open water.

Figure 4.4-1 The Hydrologic Cycle

SOURCE: MODIFIED FROM GORDON, N.D., McMAHON, T.A., FINLAYSON, B.L., 1992

and uplands of the Coast Ranges (24 inches per year) than the valley floor (19 inches per year) (US Department of Commerce, 1992). Most of the rainfall occurs between the months of November and March; and virtually none falls between June and September. Snowfall and snowpack are negligible in the Coast Ranges uplands of Yolo County. Analysis of long-term precipitation records indicates that wetter and drier cycles lasting several years are common in the region. Severe, damaging rainstorms occur at a frequency of about once every three years in the central California region (Brown, 1988).

The average annual temperature in Yolo County is 62 degrees Fahrenheit (°F). The average daytime high temperature in the summertime is 100°F. Summertime temperatures have been recorded in excess of 115°F in Yolo County (Scott and Scalmanini, 1975).

<u>Surface Water</u>

The planning area contains portions of two drainage basins: the Cache Creek basin and the Willow Slough Basin (Figure 4.4-2). The Putah Creek Basin is also a major drainage basin in the region, but does not directly affect hydrology and/or water quality in the planning area.

Cache Creek is the principal drainage feature within the Cache Creek basin, and drains an area of over 1,140 square miles (NHC, 1995). Cache Creek originates at Clear Lake in the Coast Ranges (approximately 35 miles northwest of the planning area) and flows easterly to the Sacramento Valley. The topography of the Cache Creek basin varies from the steep uplands of the Coast Ranges between Clear Lake and the town of Capay, to the relatively gentle slopes of the valley downstream of Capay.

Diversions of Cache Creek occur at the Indian Valley Dam (on the North Fork of Cache Creek), an earthen dam at Rumsey, and the Capay Dam (located at the western margin of the planning area). The dam at Capay diverts nearly all summertime flows to the Adams and Winters Canals for agricultural use. The mean annual runoff[2] within Cache Creek is estimated at 577,000 acre-feet at Capay and 374,000 at Yolo (NHC 1995).

Indian Valley Reservoir, located on the North Fork of Cache Creek, has a storage capacity of about 300,000 acre-feet, of which 40,000 acre-feet is for flood control storage. The dam was built in 1975 by the Yolo County Flood Control and Water Conservation District (YCFCWCD). If the Indian Valley Dam were to fail, the planning area could be inundated by up to 17 feet of water, depending on the location. The first wave would reach the western portion of the planning area in approximately 4.0 hours (YCFCWCD, 1996).

Willow Slough is the principal drainage feature within the Willows Slough Basin, which flows in an easterly direction. Willow Slough Basin (which includes Dry Creek Slough, Lamb Valley Slough, Cottonwood Slough, and Union School Slough) drains an area of

[2] The mean annual runoff is the average total volume of surface water that passes in a single year a given location (such as a gauging station) on a creek or river each year

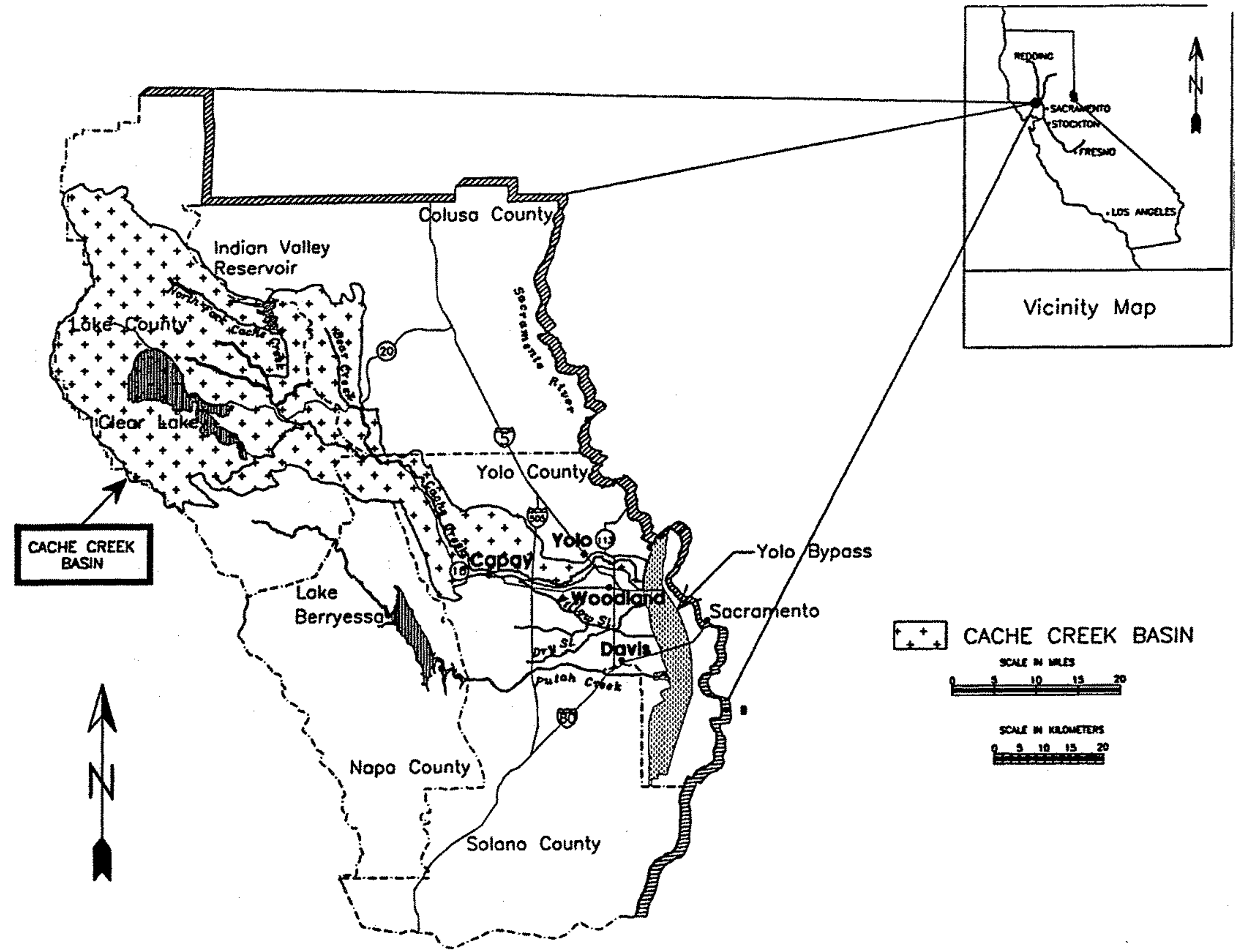


Figure 4.4-2 Regional Drainage

SOURCE: USACOE, 1995

approximately 200 square miles (USACOE, 1994). The Slough receives storm water runoff and agricultural tailwater from the entire central portion of Yolo County. Willow Slough also receives water from several canals, irrigation ditches, and small tributaries; flow within the Slough is often sporadic.

Flooding

Flooding results from short-duration high intensity rainfall, long-duration low intensity rainfall, failure of a dam or levee, or a combination of these conditions. Overtopping of the channel banks of Cache Creek or the drainage within Willow Slough could cause flooding within the planning area.

The flood of record (maximum recorded discharge) for Cache Creek (recorded at the town of Yolo[3]) was 41,800 cubic feet per second (cfs) 9 March 1995 (NHC, 1995). The second highest flood of record occurred on 25 February 1958 and was measured at 41,400 cfs, as compared to mean annual flows of 515 cfs between 1903 and 1992 (USGS, 1992). The calculated flood discharges corresponding to the 10-year and 100-year flood events for Cache Creek at Capay Dam are 30,000 cfs and 64,000 cfs, respectively (USACOE, 1994). The majority of the Cache Creek system is characterized by short stream reaches with steep gradients, and therefore peak flood flows usually pass through the basin within a 24-hour period.

Existing levees along Cache Creek in the vicinity of Yolo and Woodland, east of the planning area, are overtopped by floods greater than the 10-year event. Floods greater than the 10-year event threaten the town of Yolo and the City of Woodland. The U.S. Army Corps of Engineers (USACOE) has completed a preliminary review of the problem and has recommended that feasibility-level studies be prepared to further evaluate the appropriateness of structural improvements (setback levees and channel improvements) (USACOE, 1994).

Drainage within Willow Slough results in frequent overtopping of banks (as recently as January 1995, but also in 1958, 1963, 1983, and 1986) and flood areas near SR 16 and the southern portion of the planning area (USACOE, 1994; Russo, 1995).

Groundwater

Groundwater in the Cache Creek and Willow Slough basins occurs in both the Tehama formation[4] and the overlying younger alluvial deposits. The overlying younger alluvial deposits, which consist primarily of sand and gravel with intermittent layers of silt and clay,

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[3]The river gauging station at Yolo on Cache Creek (No. 11452500) is located at the eastern end of the project area, and is the nearest USGS gauging station.

[4]The Tehama formation consists of poorly sorted sediments comprised of thick-bedded, sandy silt and clay. Gravel and sand deposits are usually thin and discontinuous (DWR, 1978).

comprise the more important groundwater producing unit because yields to wells are significantly higher. The thickest sand and gravel deposits occur nearest to Cache Creek. Along the Creek, the thickest deposits occur west of the Plainfield Ridge. The Plainfield Ridge is an uplifted portion of the Tehama formation which acts as a subsurface restriction to the flow of groundwater. The ridge tends to cause the accumulation of sediments on the upstream (west) side.

Uppermost groundwater is unconfined[5] and typically encountered between 10 and 75 feet below the ground surface in the region, depending on the local topography and seasonal recharge. At a particular site, seasonal fluctuations of groundwater levels can exceed 25 feet (David Keith Todd, 1995). The regional groundwater flow direction is consistently to the east/southeast and relatively parallel to Cache Creek (Figures 4.4-3 and 4.4-4). Depressions in the water table form around pumping wells, particularly during drought periods, which can alter local groundwater flow directions.

The YCFCWCD manages surface water storage and diversion in Yolo County. There is currently no regional groundwater management program. Private and public property owners may, at their discretion, install and operate groundwater supply wells. Pumping and use of groundwater is the right of each property owner. Disputes over uses of groundwater within a basin or subregion are generally resolved through adjudication. The YCFCWCD has released a conceptual plan for Cache Creek Groundwater Recharge Project (1991) which would divert surface waters (that may, if not diverted, flow out of the basin) into temporary groundwater storage via infiltration into recharge basins. It is not known when or if a comprehensive final plan will be developed and implemented.

Evaporation and Evapotranspiration

Evaporation[6] from open water and evapotranspiration[7] from agricultural and habitat areas accounts for a significant amount of water lost from the surface and shallow subsurface in arid environments. Evaporation rates from open water bodies (i.e., lakes) in the area are estimated at 47 inches per year (Table 4.4-1).

Evapotranspiration rates of various crops has been quantified for the Sacramento Valley. Annual evapotranspiration rates for irrigated pasture grass have been estimated at 43.7 inches. Other crops, such as beets, tomatoes, beans, and barley, generally transpire less than uncut grasses, with a range of 11 to 30 inches annually (DWR, 1975).

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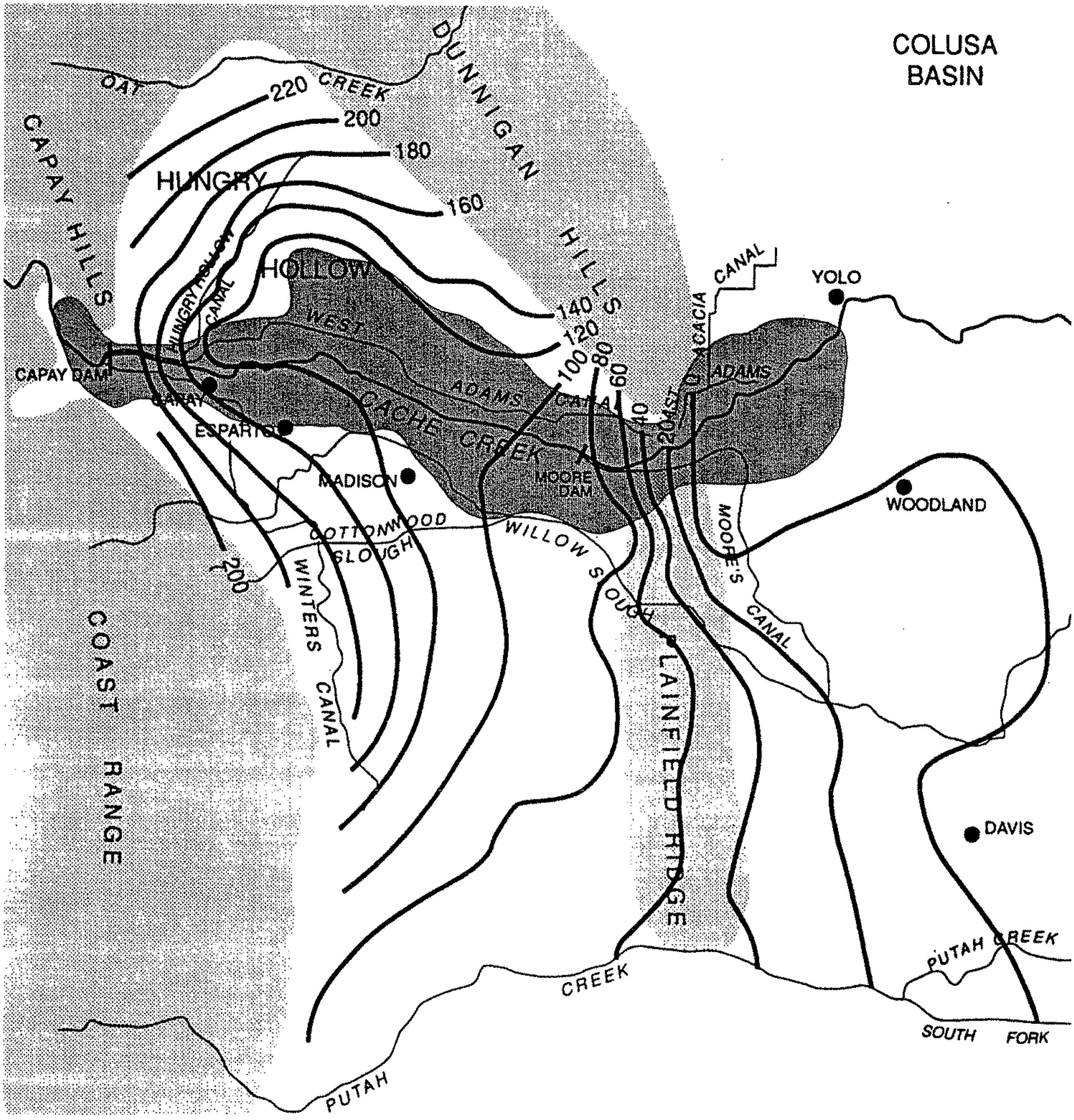
[5]An aquifer is "unconfined" when the uppermost water table surface is free to move up and down.

[6]The conversion of liquid water to vapor.

[7]The sum of evaporation and transpiration. Transpiration is the process by which plants give off water vapor through their leaves.

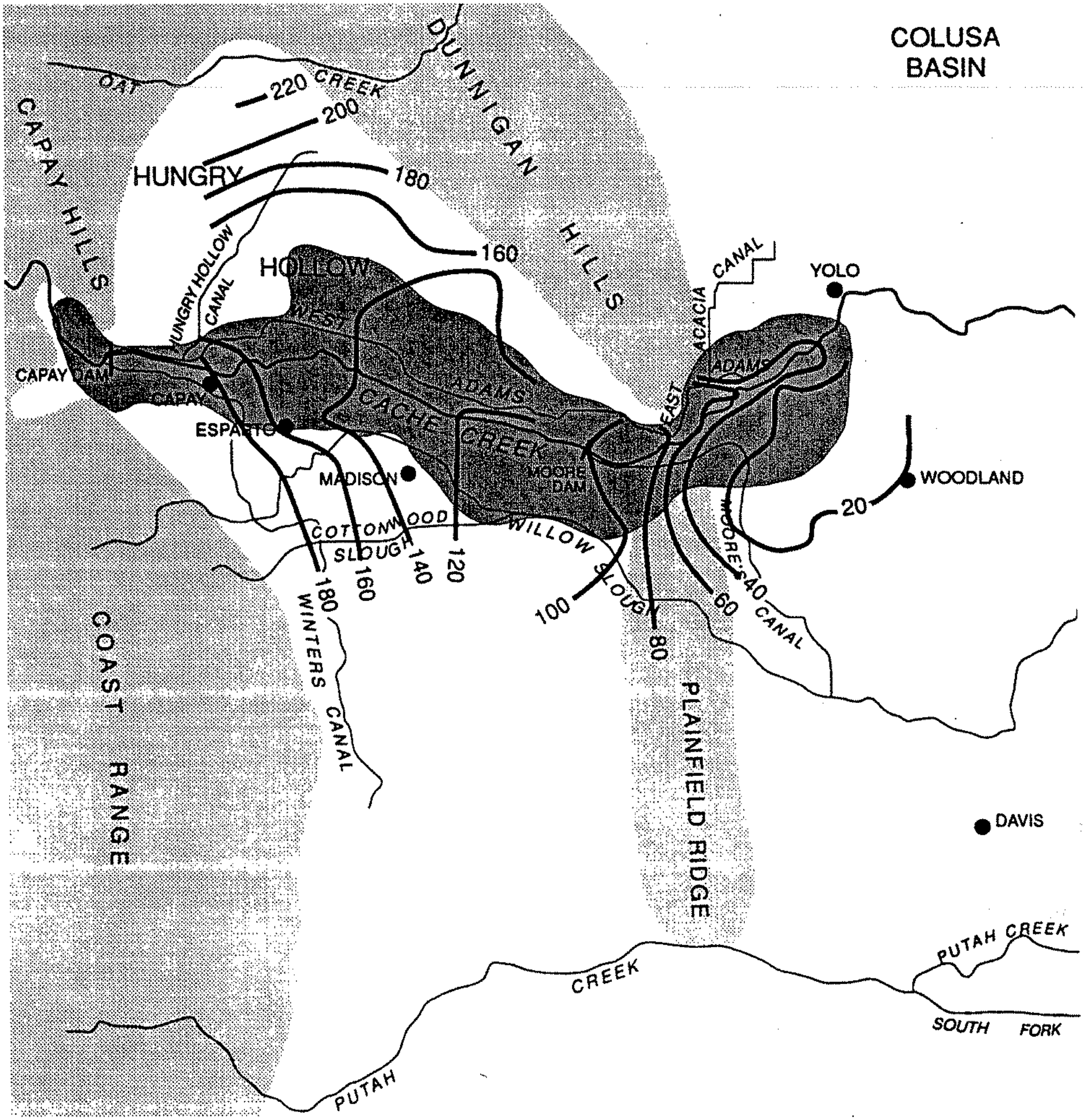


Planning Area

—— 140 —— Groundwater contour above MSL

SOURCE: ADAPTED FROM LUHDORFF AND SCALMANINI (1992), AND DAVID KEITH TODD (1995)

Figure 4.4-3 Groundwater Elevation Contour Map, Fall 1991



Planning Area

140 Groundwater contour above MSL

Figure 4.4-4 Groundwater Elevation Contour Map, Spring 1993

SOURCE: EIP et al (1995)

Table 4.4-1: Evapotranspiration Losses of Alternative Land Uses		
Land Use	Evapotranspiration	
	Feet/Year	Inches/Year
Pan Evaporation[1]/Wetland Habitat	5.42	65.0
Lake	3.92	47
Irrigated Pasture	3.64	43.7
Alfalfa	3.53	42.3
Rice	3.50	42.0
Subtropical Orchard (Tree Crop)	2.60	31.2
Sugar Beets	2.48	29.8
Almonds	2.38	28.5
Tomatoes	2.28	27.4
Table Grapes	2.23	26.7
Corn	2.05	24.6
Grain Sorghum	1.78	21.3
Potatoes	1.65	19.8
Dry Beans	1.35	16.2
Barley	0.95	11.4

Source: DWR, 1975.

1 The use of evaporation pans is the most common method to estimate the maximum potential evaporation rate of a given area. This maximum evaporation rate (5.42 feet/year (EIP et al., 1995) is assumed for the shallow wetland areas around the reclaimed wet pits within the planning area.

Water Quality

The quality of surface and groundwater in the Cache Creek and Willow Slough basins is affected by source water quality,[8] geologic materials through which groundwater flows, and by land uses within the watershed. In general, groundwater contains higher concentrations of total dissolved solids (TDS) than surface waters due to the relatively slow movement of groundwater and correspondingly longer contact with soluble minerals in the subsurface.

[8]Source water quality refers to the quality of surface water (e.g., reservoir releases) and groundwater (e.g., springs) that discharge into Cache Creek upstream of the planning area.

Surface water bodies tend to be more susceptible to degradation by sediment-laden runoff and potential chemical discharges because they are exposed at the surface.

Water quality in surface and groundwater bodies is regulated by the State Water Resources Control Board and Regional Water Quality Control Boards. The planning area is under the jurisdiction of the Central Valley Regional Water Quality Control Board (RWQCB), which is responsible for the implementation of State and Federal water quality protection guidelines.

Water quality has been monitored in surface water and groundwater in the Cache Creek and Willow Slough hydrologic basins since the early 1950s. In general, water quality in the basins is considered excellent for agricultural purposes (except for elevated levels of boron), and fair for domestic use (Scott and Scalmanini, 1975; Evenson, 1985).

Groundwater quality in the western portion of the valley is typically poorer than elsewhere, often exceeding the State secondary drinking water standards for TDS (500 mg/L) (Department of Water Resources, 1978). In general, salts occur in the groundwater in the Cache Creek basin at acceptable concentrations, except boron. Boron, which is necessary for plant growth but toxic to certain plants at concentrations in excess of 1.0 mg/L, is imported to the Cache Creek basin. Since Cache Creek is a significant groundwater recharge feature, groundwater quality in the basin has been affected by the elevated levels of boron (Scott and Scalmanini, 1975). Boron-rich waters flow into Cache Creek from natural hot springs in the Bear Valley drainage. The YCFCWCD monitors Cache Creek for boron. Runoff and flow in Cache Creek resulting from the first rainfall events each winter tend to contain higher concentrations of boron than flows during the rest of the year. The YCFCWCD does not divert these "first flush" flows into the irrigation canal system (Barton, 1996).

Cache Creek is listed as an "Impaired Waterway" by the Central Valley Regional Water Quality Control Board in compliance with section 303(d) of the Clean Water Act (Yee, 1996). Grab samples collected from the creek during the winter of 1995 were found to contain mercury in excess of the Maximum Contaminant Level (0.002 mg/L). In addition, samples were subject to bioassay testing and found to be toxic to invertebrates. Mercury may have been introduced to the lower Cache Creek basin by leaching of natural mercury deposits in the upper basin and from the Sulphur Bank mine located at Clear Lake (USACOE, 1995). The designation as an impaired waterway serves to notify the public of potential water quality degradation. When funding becomes available, the RWQCB, in conjunction with the Yolo County Department of Public Works, may conduct additional water quality monitoring and establish Total Maximum Daily Loads for dischargers of contaminants to the Cache Creek system (Yee, 1996). The U.S. Army Corps of Engineers has recommended that any excavation work proposed within the Cache Creek channel should be preceded by collection of sediment samples for analysis of mercury. The proposed project (OCMP) does not include disturbance of channel sediments. Potential impacts associated with disturbance of channel sediments and remobilization of mercury are more fully addressed in the CCRMP.

Available analytical data on water quality samples collected from wells in the Cache Creek area are limited. Numerous wells have been sampled on single occasions and several wells have been analyzed for mineral quality over various periods. In the vicinity of Cache Creek below Capay, the data suggest consistent water quality with no observable degradation over the last 20 to 40 years. Community water supply sources in Esparto, Madison, Yolo, and south of the Yolo Fliers Club were all screened for organic chemicals in 1985; none were detected in any of the wells.

BASELINE conducted an informal survey of several agencies[9] in California that are involved with water quality issues and wet pit mining. Each agency was asked 1) whether or not wet pit gravel mining occurs within their jurisdiction, 2) whether water quality problems associated with the pits had been reported, 3) whether water quality monitoring had been conducted in surface and/or groundwater in the vicinity of the wet pits, and 4) whether pesticides and/or herbicides are used in the vicinity of the wet pits. In general, the responses indicated that wet pit mining had not resulted in any reported water quality problems. However, none of the agencies reported the collection of adequate data that would allow analysis of water quality trends in the vicinity of wet pits. Agricultural land uses, including use of pesticides and herbicides, in the vicinity of wet pits was reported by several agencies. However, no water quality problems had been reported.

A wide variety of potential sources of surface water and groundwater contamination occur within the Lower Cache Creek basin. Potential sources of contamination, shown on Figure 4.4-5, can be divided in six categories as follows (EPA, 1987):

Category 1 — Intentional discharges. These releases are intended to occur and generally include established controls for mitigation of potential impacts. The systems are generally designed to use the natural capacity of soils and the aquifer to degrade wastewater (e.g., cess pools, septic tanks, injection wells, and land application of wastewater and sludge). It is estimated that septic tanks and cess pools discharge the greatest volume of wastewater to the subsurface and are the most frequently reported source of groundwater contamination (Miller, 1980).

Category 2 — Releases from storage and treatment areas. These releases are not intended to occur. These systems are designed to store and/or treat substances (e.g., landfills, open dumps, and underground storage tanks).

Category 3 — Releases during transport. These releases are not intended to occur. These systems are designed to transmit products or waste (e.g., fuel pipeline, sewer lines). Releases from these systems generally occur due to accidents or neglect and would include sabotage and illegal dumping.

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[9]The agencies contacted included: the Central Valley Regional Water Quality Control Board, Yuba County Planning Department, Fresno County Public Works, Zone 7 (Alameda County), California Department of Water Resources, Humboldt County Planning Department, San Benito County Planning Department, Tulare County Planning and Development Department.

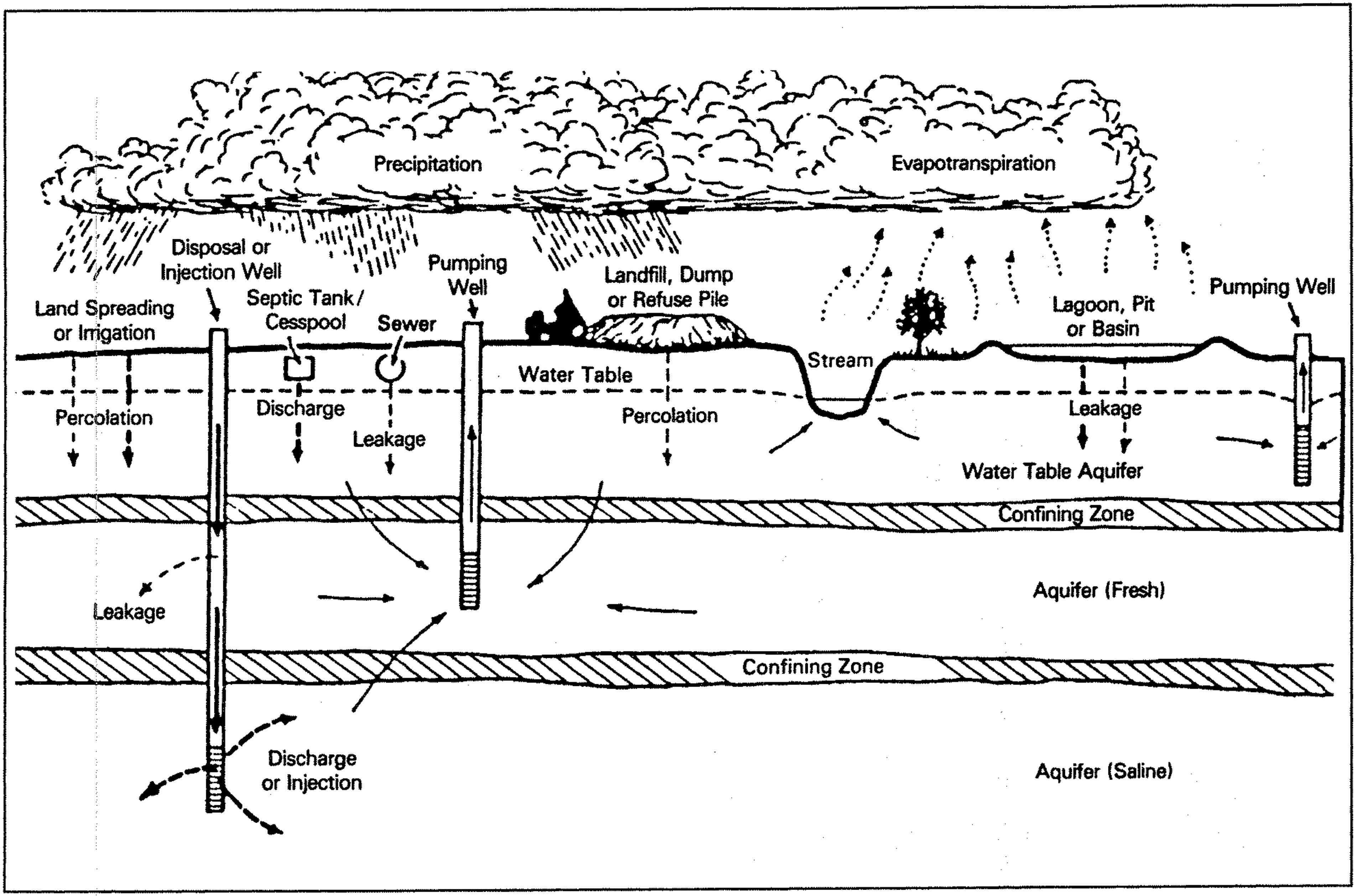

Figure 4.4-5 Potential Sources of Groundwater Contamination

SOURCE: EPA, 1987

Category 4	Discharges associated with other activities. In general, these releases are intended to occur, though controls for potential impacts are often minimal or nonexistent. This category contains agricultural activities (irrigation runoff, feedlot operations, and pesticide application) and urban runoff.
Category 5	Contamination through conduits. These releases are not intended to occur. This category includes creation of conduits that allow contamination to reach the groundwater (e.g., poorly designed wells, exploration holes, construction excavations, wet pit gravel mines, and drainage from existing or abandoned hard rock mines).
Category 6	Naturally occurring sources. Some naturally occurring sources of contamination can impact surface and/or groundwater quality. Problems associated with naturally occurring sources of contamination can be exacerbated by human activity. Salt water intrusion can be caused by overpumping of groundwater. Recharge of an aquifer with poor quality surface water (i.e., high boron content) can adversely impact groundwater quality.

Municipal Water Supply Wells

The towns of Esparto, Madison, and Yolo and the City of Woodland operate municipal wells within five miles of proposed mining areas. No other municipal wells have been identified in the five mile radius. The town of Capay does not have a municipal water system; homes are serviced by individual domestic wells (Lopes, 1996). The locations of municipal wells are shown of Figure 4.4-6. These municipalities rely entirely on groundwater resources for water supply.

The approximate distances from the nearest proposed mining area to the wells providing water for each municipality are summarized in Table 4.4-2. In addition, the table indicates whether the wells are located in upgradient, downgradient or cross gradient position relative to proposed mining areas. The regional groundwater flow directions are shown of Figures 4.4-3 and 4.4-4.

In many cases groundwater is adequately free of contaminants (both chemical and biological) to distribute and use as a drinking water source without any treatment (Simons, 1996). The water supply systems of each municipality are tested regularly for a variety of organic and inorganic compounds, as required by the USEPA and the Yolo County Department of Public Health. Based on results of these analyses, the water supplies meet or exceed established quality standards. Currently, the towns of Esparto, Madison, and Yolo do not treat, chlorinate, or otherwise disinfect the groundwater supplied to customers (Lopes, 1996; Burns, 1996; Horgan, 1996). The City of Woodland began chlorinating portions of its water supply in 1993 when bacteria were identified in 7 of the 18 active wells operated by the City (Phipps, 1996).

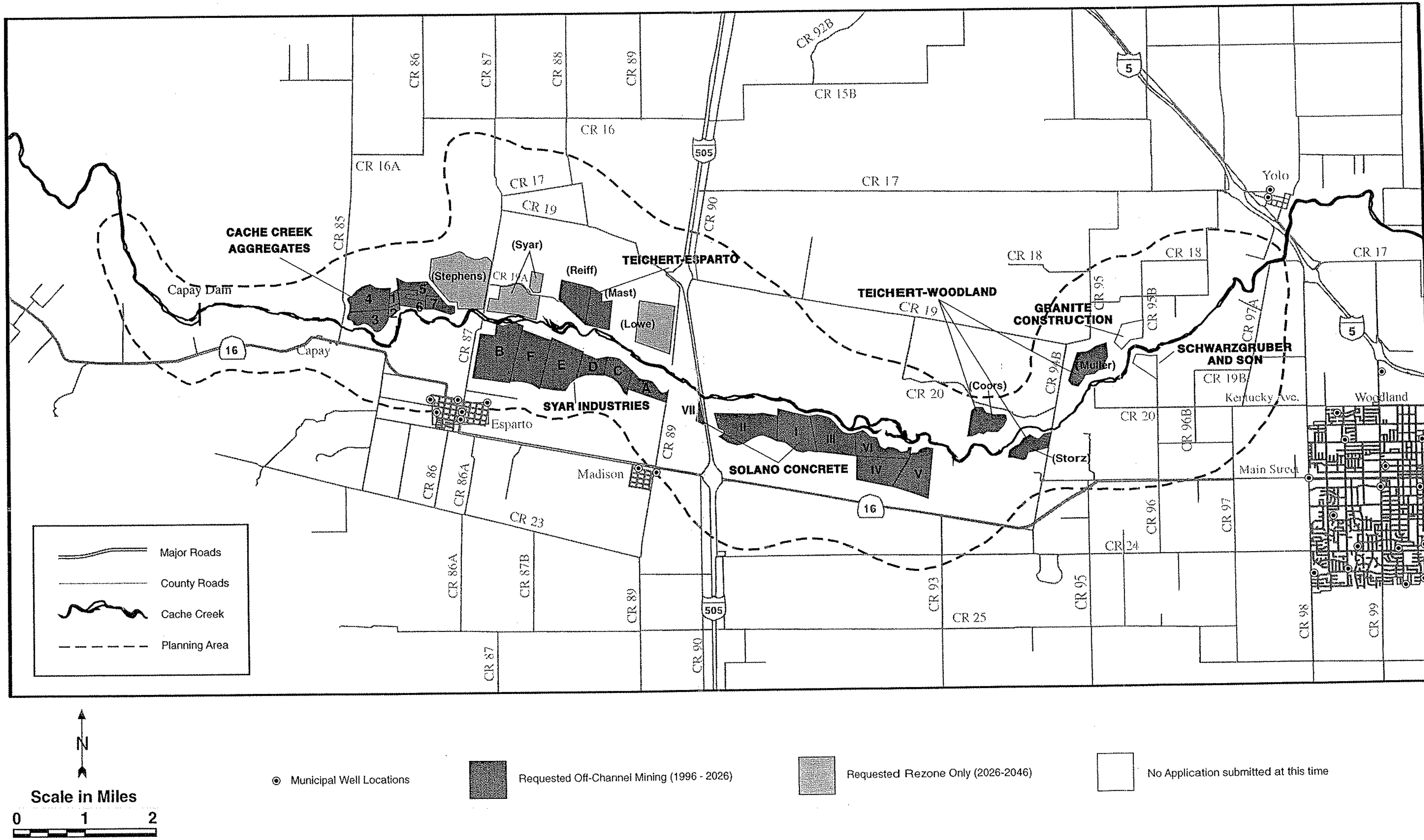

Figure 4.4-6 Municipal Well Locations

SOURCE: INDIVIDUAL MINING APPLICATIONS

Table 4.4-2: Municipal Well Locations Relative to Proposed Mining Sites		
Municipality	Distance to Nearest Mining Site (feet)	Position Relative to Regional Groundwater Flow Direction
Esparto	1,750[1]	crossgradient
Madison	5,000[2]	crossgradient
Yolo	14,000[3]	downgradient
Woodland	10,500[3]	downgradient

[1] Distance to "West Solano" mining area, Solano Concrete.
[2] Distance to "Phase B" mining area,. Syar Industries.
[3] Distance to "Schwarzgruber and Son."

Approximately half of the community groundwater systems operating in the United States do not treat their water. In general, groundwater is less susceptible to microbial contamination than surface water. However, it is estimated that 60-70 percent of groundwater sources have been contaminated with fecal viruses and bacteria (Macler, 1996a). The Surface Water Treatment Rule (SWTR), developed by the EPA and promulgated in 1989, addressed microbial contamination of drinking water from surface water sources. Contained within the SWTR is a procedure for determining whether a water supply intake (i.e. well) is located near enough to a surface water supply for the pumped water to be considered surface water. For example, water supplied from a well completed within gravels of an active channel of a river would likely be considered surface water. None of the municipal wells in the vicinity of the project are near enough to surface water supplies to be considered under the SWTR (To, 1996).

The EPA is in the process of developing a Groundwater Disinfection Rule that would attempt to address potential public health concerns regarding microbial contamination of groundwater. It is anticipated that the disinfection rule would employ a "treatment technique" rather than attempt to achieve a particular water quality threshold because practical methods to detect pathogens before they reach an end-user are not available (Macler, 1996a). It is estimated that the Groundwater Disinfection Rule may be promulgated in 1998 and would require all municipalities which rely on groundwater supplies to disinfect or demonstrate that the groundwater is "naturally disinfected."

Description of Local Environment

The definition of the planning area boundary is, in part, hydrologically based. The planning area includes all areas within the mapped Mineral Resource Zones between the towns of

Capay and Yolo, less the active channel[10] of Cache Creek (Figure 3.2-3), which is addressed by the Cache Creek Resource Management Plan (CCRMP). Since the Cache Creek channel is, by definition, outside the planning area, the hydrology of the Creek is not extensively discussed in this EIR. The EIR on the CCRMP includes a more detailed description of processes within the Cache Creek channel. The terraces adjacent to the Creek outside the 100-year floodplain, and portions of the Willow Slough Basin comprise the planning area and are discussed in this section.

Surface Water

In an undeveloped or agricultural setting, a significant amount of precipitation that falls on the ground infiltrates into the subsurface. When rainfall intensities exceed the infiltration capacity of surface soils, runoff flows over the ground surfaces toward established natural or constructed drainage channels. Storm water runoff is then conveyed away from the area in creeks and canals. In a developed setting much of the natural soils can be covered with impervious surfaces (i.e., roads, driveways, and roofs), reducing infiltration and increasing amounts and altering flow patterns of runoff. The existing conditions within the planning area include very limited impervious cover.

The planning area includes three general types of land uses; agriculture, rural residential, and aggregate mining. The primary land use is irrigated agriculture. During the spring and fall, drainage of agricultural tailwater directly into creeks or irrigation canals is common practice in the area (USACOE, 1994). Runoff (the amount of precipitation that is transported away by drainage) from the planning area is estimated at 2.5 inches per year (Rantz, 1974).

The planning area is partially located within the 100-year flood hazard zone (floodplains of Cache Creek and Willow Slough, Figure 4.4-7) as mapped by the U.S. Department of Housing and Urban Development, Federal Insurance Administration (USFIA, 1980),[11] indicating that portions of the area could be inundated during the 100-year storm event.[12] FEMA generates Flood Insurance Rate Maps (FIRMs) which depict flood hazard areas within studied communities for use as planning tools. In most environments, FIRMs represent the best available estimate of the limits of the 100-year flood.

Within the planning area, alterations to the Cache Creek channel resulting from in-stream mining and improvements to the levees along the creek have resulted in significant changes to the 100-year floodplain. The FIRMs are no longer accurate. As required by

[10]The active channel is defined as the area of 100-year flood inundation or existing channel banks, whichever is farther landward.

[11]FIA was a predecessor of the Federal Emergency Management Agency (FEMA).

[12]The "base flood" (or 100-year flood) is the flood having a one percent chance of being equaled or exceeded in any given year. In any single 100-year period, several "base flood" events (or none) *could* occur. But over the long term, the frequency of the "base flood" is expected to *average* once in 100 years.

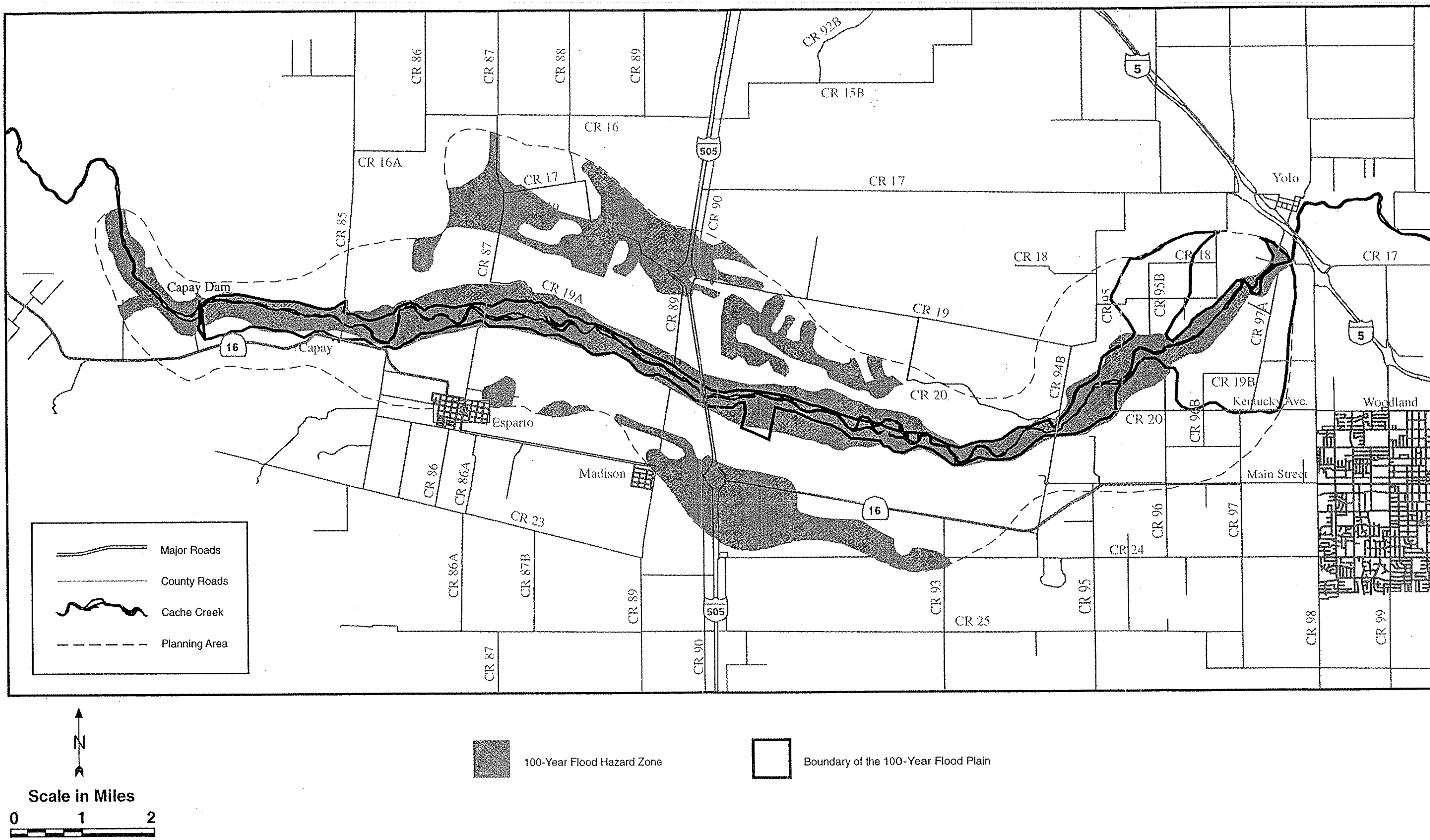

Figure 4.4-7 Cache Creek Flood Plain

SOURCE: FIA, 1980; U.S. ARMY CORPS OF ENGINEERS, 1994

County Resolution, the mining facilities which operate along Cache Creek must maintain 100-year flood protection for plant facilities and off-channel mining areas. Therefore, the active off-channel mining operations have performed hydraulic analyses to verify 100-year protection. These more recent analyses, which take into account channel modifications and levee improvements, indicate different floodplain limits than the 1980 FIRMs.

FEMA is in the process of updating the FIRMs for the planning area, but may not release the new maps for several years (Bencomo, 1995). Difficulty arises when the FIRMs are not accurate and development or erosion-control measures are proposed within the floodplain. Under the County Flood Ordinance, the County is bound to enforce permitting and development restrictions within the FEMA designated floodplain, even if the floodplain designation is incorrect. When significant modifications to a floodplain occur, a Letter of Map Revision to FEMA is required requesting an update to existing FIRMs.

Groundwater

The groundwater levels and flow direction in the planning area are generally consistent with the regional easterly to southeasterly gradient. However, significant perturbations in the flow direction can occur in the vicinity of active pumping wells (industrial, municipal, and agricultural).The recharge/discharge relationship between Cache Creek and the aquifer varies by location, and changes with seasonal fluctuations in the elevation of the groundwater table. Portions of the creek that are actively being recharged by the aquifer are termed "gaining" reaches (Figure 4.4-7). Those portions of the creek that recharge the aquifer are termed "losing" reaches (Figure 4.4-7). Review of various past investigations (David Keith Todd, 1995) indicates that, during the dry season (low groundwater), most of the Creek is losing water (with the exception of the reach just upgradient of the Plainfield Ridge). During periods of high groundwater,[13] part or all of the reach between the Esparto Bridge and the Plainfield Ridge may become a gaining reach.

When the water table in the banks of Cache Creek is higher than the thalweg[14] in the active channel groundwater flows into the channel (and would be considered a gaining reach). This phenomena has been termed the "chipped tea cup" theory (Woodward-Clyde, 1976) because it was thought that the elevation of the thalweg largely controlled the amount of groundwater that could be stored in the aquifer just as a full tea cup will drain to the level of a chip in its rim. Subsequent studies have concluded that the apparent loss of aquifer storage observed in the 1950s through the mid-1970s was the combined result of drought and extensive groundwater pumping (David Keith Todd, 1995). By 1983, the groundwater levels in the basin had essentially recovered to pre-1950s levels, confirming that significant aquifer storage capacity had not been lost.

[13]In the late winter and spring, the water table is elevated due to infiltrating rainfall and lack of pumping for agriculture.

[14]The line joining the deepest points of a creek channel.

Regulatory Framework

The following section lists the regulations, plans, and policies that would be applicable to the project. The impact section discusses the conformance of the project with these plans, policies, and regulations, when applicable.

Clean Water Act

Section 402(p) of the Clean Water Act (CWA) and implementing regulations require control of storm water discharges as part of the National Pollutant Discharge Elimination System (NPDES) program. Discharges of storm water from certain industrial activities and large municipalities require a permit under the NPDES program.

Implementation of the NPDES program has been delegated to the State of California. The State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) are the implementing agencies in the State. The SWRCB adopted a General NPDES Permit for Discharges of Storm Water Associated with Industrial Activities (General Permit) in 1991. Sand and gravel, crushed rock, asphaltic concrete, and concrete operations are included in the list of industries required to apply for inclusion under the General Permit.

SMARA and Related Regulations

The California Surface Mining and Reclamation Act (SMARA) of 1975 requires that the State adopt regulations which establish State policy for reclamation of mined land, including measures to be employed by lead agencies in specifying water quality, watershed, and flood control protection (Sec. 2756). In addition, SMARA requires adoption of regulations specifying minimum verifiable state-wide reclamation standards for drainage and stream protection (Sec. 2773).

The State reclamation regulations contain several minimum acceptable practices and performance standards for drainage diversion structures, waterways, and erosion control (CCR Title 14 Section 3706) that may pertain to mining within the planning area, including:

Sec. 3503(b)(1) Settling ponds or basins shall be constructed to prevent sedimentation of streams at operations where they will provide a significant benefit to water quality.

Sec. 3503(b)(2) Operations shall be conducted to substantially prevent siltation of groundwater recharge areas.

Sec. 3706(b) The quality of water, recharge potential, and storage capacity of groundwater aquifers which are the source of water for domestic, agricultural, or other uses dependent on the water, shall not be diminished, except as allowed in the approved reclamation plan.

Sec. 3706(c) Erosion and sedimentation shall be controlled during all phases of construction, operation, reclamation, and closure of a surface mining operation to minimize siltation of lakes and watercourses, as required by the Regional Water Quality Control Board or the State Water Resources Control Board.

Sec. 3706(d) Surface runoff and drainage from surface mining activities shall be controlled by berms, silt fences, sediment ponds, revegetation, hay bales, or other erosion control measures, to ensure that the surrounding land and water resources are protected from erosion, gullying, sedimentation, and contamination. Erosion control methods shall be designed to handle runoff from not less than the 20 year/1 hour intensity storm event.

Sec. 3707(d) Use of fertilizers or other soil amendments shall not cause contamination of surface or groundwater.

State Reclamation Board Policies

The Reclamation Board (Board), a division of the California Department of Water Resources, is authorized under the State Water Code. It is the policy of The Reclamation Board to allow local control over the extraction of sand and gravel from floodways, so long as the Board's responsibilities in the area of floodway preservation are not jeopardized or compromised.

When local agencies act as a lead agency, the Board will act as a responsible agency in matters of floodway protection -- with emphasis on the early consultation process. The Board will continue to require applications for encroachment in accordance with its adopted procedures and standards.

Specific policies that relate to off-channel excavations include:

1. Unless a greater distance is stipulated by the levee maintaining agency, material shall not be excavated from within 100 feet of (a) the toe of any levee, or (b) an adjacent property boundary line.

2. The depth of the excavation shall be no lower than specified in the approval of Plans. For information on permitted depth for excavations adjacent to the landslide of a levee, contact Department of Water Resources, Central District, P.O. Box 160088, Sacramento, California 95816; Attention: Application Review Unit, or telephone (916) 445-3942.

3. The excavation shall be performed in either of the two following manners:

    a. Progressive Borrow. Material shall be excavated in strips parallel to the levee, progressing across the approved excavation area, starting from the edge of the area furthest from the levee. The bottom of the excavation shall be a sloping plane to a tolerance of one foot to provide for drainage away from the levee.

    b. Uniform Borrow. Material shall be excavated in strips perpendicular to the levee, progressing entirely across the approved excavation area. The bottom of the excavation shall be a sloping plane to a tolerance of one foot to provide for drainage away from the levee.

Regional Water Quality Control Board Basin Plan

The Basin Plan is a regulatory reference for meeting the State and Federal requirements for water quality control in the Central Valley Region. The preparation of basin plans is supported by the Federal Clean Water Act and required by the State's Porter-Cologne Water Quality Control Act. The Central Valley Regional Water Quality Control Board, which is responsible for implementation of the Basin Plan in Yolo County to protect beneficial uses, evaluates discharges that may impact water quality and, if appropriate, issues numerical standards and monitoring requirements for the discharge.

Yolo County General Plan

The following policies related to water resources are included in the Safety (S) and Conservation (CON) elements of the 1980 Yolo County General Plan:

S 5 Yolo County shall regulate, educate, and provide guidelines and standards for avoiding and mitigating the effects of flooding.

S 6 Yolo County shall adopt and apply standards and ordinances for control of development relating to potential flooding and local drainage and require mitigation of identified impacts. The County may, at a future time, establish a policy for a countywide drainage plan, but does not require such a plan at this time.

S 7 Yolo County shall require development of all kinds, in areas of "acceptable low risk flooding," to be flood proof.[15]

S 9 Yolo County shall use the Federal Flood Insurance Program maps and standards in regulating and advising on development proposals in flood plains and these maps are a part of this General Plan by reference.

CON 16 Yolo County shall relate new development to water availability and water pollution avoidance or mitigation.

CON 17 Yolo County shall encourage waste water reclamation and reuse.

CON 20 Groundwater shall be protected from overdraft and shall not be encroached upon by construction. Impervious surfaces should be reduced or replaced and groundwater recharge enhanced. The use of non-impervious surfaces is encouraged.

CON 24 Yolo County shall continue to evaluate water resources and to maintain the Yolo County Water Resources Plan.

CON 35 Yolo County shall adopt a Cache Creek Management Program for the carefully managed use and conservation of Cache Creek and its sand and gravel resource, its riverside environment, its relationship to ground and surface water characteristics, and its value as a fishery and recreation resource.

CON 37 Yolo County shall cooperate with the Reclamation Districts to develop an adequate surface drainage plan.

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[15]Flood proof: Structures and facilities designed and constructed to accept the maximum 100-year flood circumstance without significant hazard to the public, to occupants, or to users, nor to sustain significant damage to vital systems that would lead to such hazards.

CON 40 Yolo County shall prohibit surface water courses or groundwater recharge areas to be used for dumping sites for toxic materials or secondarily treated waste water and shall support agricultural practices to minimize chemical and nutrient runoff, erosion, and siltation, and support the use of check dams.

Flood Damage Prevention Ordinance (Flood Ordinance)

The purpose of the Yolo County Flood Ordinance is to "...promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas (Sec. 8-3.103)."

The Flood Ordinance includes the following relevant objectives (Sec. 8-3.104):

(a) Restricting or prohibiting uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities;

(b) Requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(c) Controlling the alteration of natural floodplain, stream channels, and natural protective barriers, which help accommodate or channel flood waters;

(d) Controlling filling, grading, dredging, and other development which may increase flood damage, and

(e) Preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

The Flood Ordinance requires acquisition of a Development Permit (Sec. 8.3-401) before construction or development begins in any area of special flood hazard.

IMPACTS AND MITIGATION MEASURES

Standards of Significance

The project would have a significant effect on hydrology and water quality if it would result in:

- Substantial changes in absorption rates, drainage patterns, or rate and amount of surface runoff.
- Exposure of people or property to water-related hazards such as flooding (100-year or more frequent flood frequency may be appropriate threshold).
- Discharge into surface water or other alteration of surface water quality (e.g., temperature, dissolved oxygen, or turbidity) in excess of applicable waste discharge requirements.
- Substantial changes in the amount of surface water in any water body.

- Substantial changes in currents, or the course or direction of water movements.

- Substantial changes in the quantity of groundwater either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations or through substantial loss of groundwater recharge capability.

- Altered direction or rate of flow of groundwater.

- Impacts to groundwater quality.

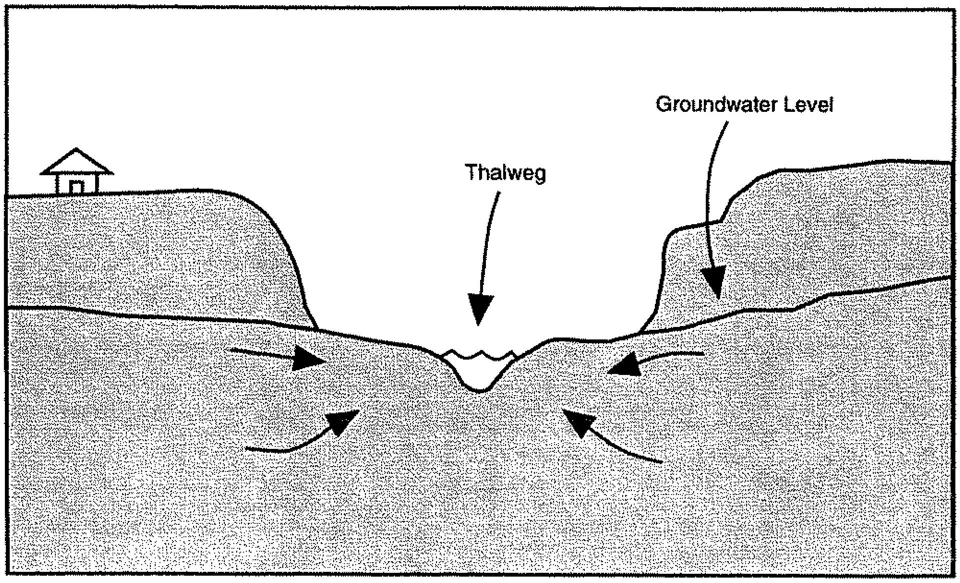
- Substantial reduction in the amount of groundwater otherwise available for public water supplies.

Impact 4.4-1
Potential Impacts to Groundwater Levels, Rate of Flow, and Direction of Flow

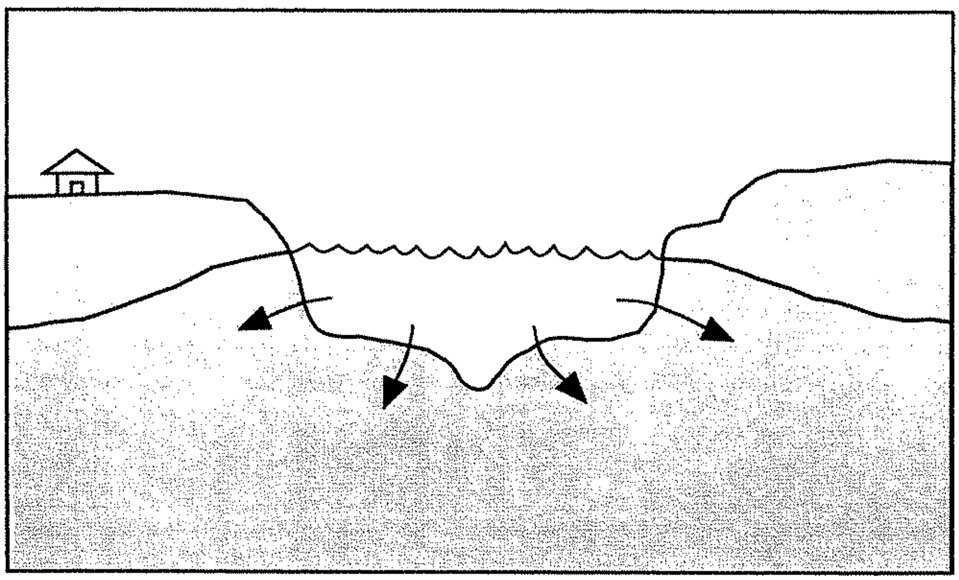
Off-channel extraction of sand and gravel deposits may include excavation below the groundwater table, creating wet pit lakes. Figure 4.4-8 depicts a typical cross-section through Cache Creek and a wet pit lake. Fine sediments generated during aggregate processing at the plants are frequently discharged into previously completed wet pit excavations. Overburden (excluding topsoil), excavated prior to mining to expose the marketable aggregate, is also frequently used to backfill the wet pits. The backfilling of wet pits with fine sediments introduces zones of reduced permeability to the aquifer (Figure 4.4-9). Groundwater continues to flow through the fine sediments, but at a somewhat reduced rate. This results in diversion of groundwater flow around the low permeability area.

Introduction of relatively low permeability zones influences groundwater levels in the vicinity of the backfilled pit. Upgradient of the pit, the low permeability zone acts as an inhibitor to flows, raising groundwater levels. Downgradient of the backfilled pit, groundwater levels are lowered because groundwater flows away from the low permeability zone in the native, coarser-grained materials faster than it can be replaced by flow through the low permeability zone. However, due to the high permeability of the surrounding native sand and gravel, groundwater levels equilibrate at a relatively short distance away from the low permeability zone (David Keith Todd, 1995).

Groundwater levels within the lower Cache Creek basin are primarily controlled by seasonal fluctuation in recharge, groundwater pumping (agricultural, municipal, and domestic), and hydrogeologic setting. On a regional scale, backfilled pits would represent a relatively minor aspect of the hydrogeologic setting. The hydrogeologic setting is essentially fixed (with the exception of creation of new backfilled pits). Seasonal fluctuations and long-term rising or falling trends in groundwater levels are almost entirely controlled by recharge and pumping. Recharge and pumping have such a large and time-dependent effect on groundwater levels, that it would be extremely difficult to distinguish between these effects and the potential localized effects of the backfilled pits.



A gaining reach. Water flows from the groundwater system to Cache Creek.



A losing reach. Surface water flow in Cache Creek recharges the banks and surrounding aquifer.

Figure 4.4-8 Schematic Cross-Section, Hydrology of Gaining and Losing Reaches

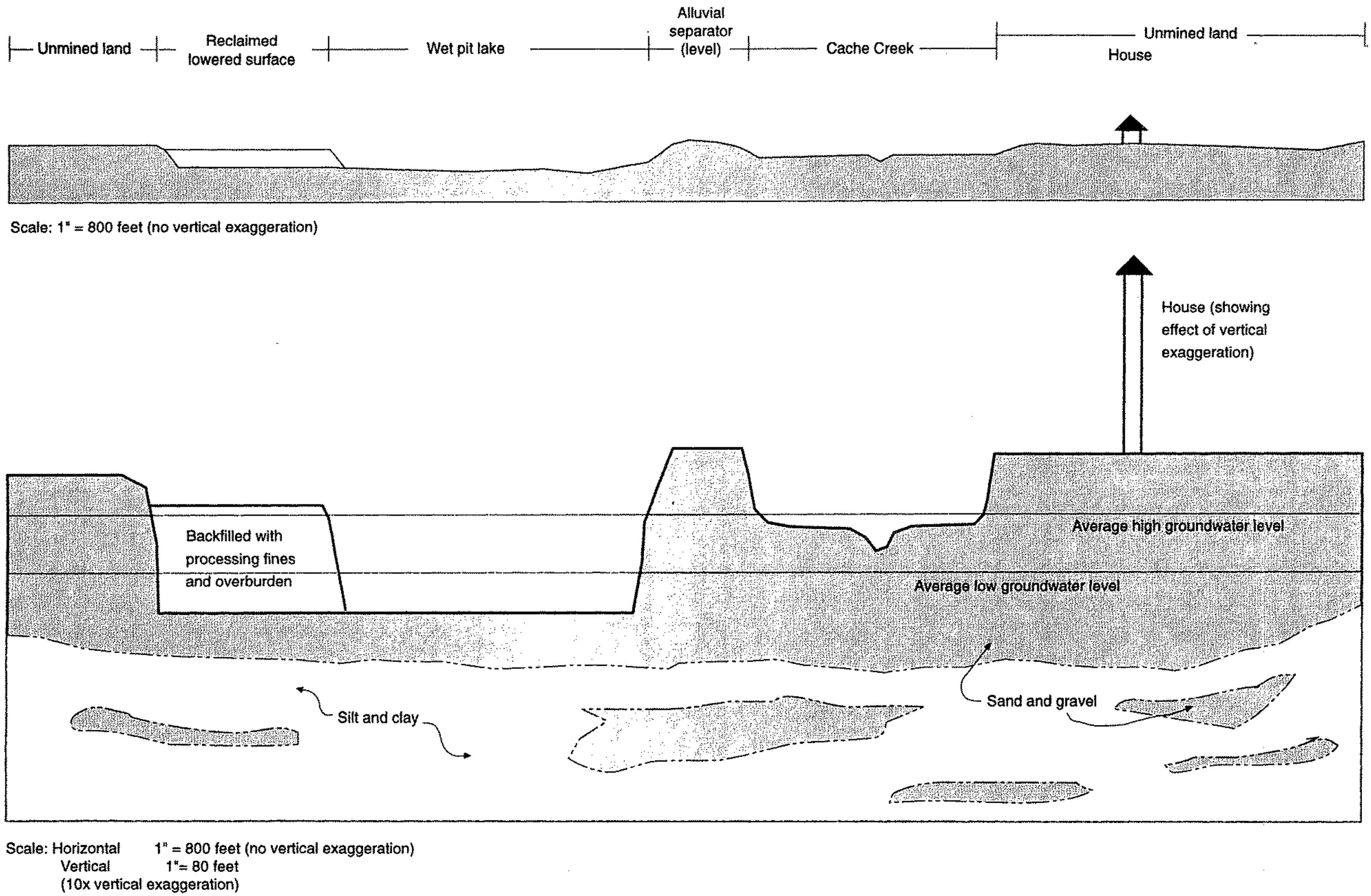


Figure 4.4-9 Typical Hydrogeologic Cross-Sections (With and Without Vertical Exaggeration)

Mathematical modeling has been conducted in an attempt to quantify the impacts to groundwater levels associated with backfilled pits (David Keith Todd, 1995). Modeling provides a framework to evaluate potential impacts under various scenarios. Modeling also allows for the isolation of recharge and pumping influences to determine what the actual effect of the backfilled pits on water levels might be. A 135-acre pit with a depth of 80 feet below the ground surface was assumed in the modeling by David Keith Todd (1995). The simulation assumed the pit was backfilled with low permeability materials. The result of the simulation indicated a maximum groundwater level decline of seven feet immediately downgradient of the pit, and a decline of one foot at a distance of 570 feet from the backfilled pit. Multiple mathematical simulations (David Keith Todd, 1995) indicated that the following are important factors when considering location and design of the backfilled pits:

- Extent of the sand and gravel aquifer. Impacts of backfilled pit of a given size will be more pronounced on a relatively thin or limited aquifer section (e.g., near the margins of the basin) than a thick, centrally located section.

- Geometry, permeability and orientation of backfill in relation to the direction of groundwater flow. The impact of backfill is generally proportional to its size. A backfill with its largest face oriented against groundwater flow will have a larger impact than one oriented within the groundwater flow direction. A less permeable backfill will have a greater impact than a more permeable one.

- Seasonal fluctuations in water levels. Impacts of backfilling are less distinguishable and significant in areas of widely fluctuating water levels.

- Location and depth of operating wells. Impacts of backfilling are generally inversely proportional to the distance from an affected well and the well depth.

Backfilling of a series of wet pits in close proximity to each other could increase the potential impacts to groundwater levels and flow. Depending on siting and design, a chain of backfilled pits could cause spatially extensive lowering of groundwater levels, adversely impacting groundwater levels in nearby wells or water levels in Cache Creek. The restriction of groundwater flow by low permeability zones may raise the water table in the vicinity of Cache Creek, upgradient from the filled pits, resulting in emergence of groundwater as surface water flow. The surface water flow may leave the basin and represent a loss in aquifer storage.

<u>Draft OCMP and Implementing Ordinances</u>

Under the OCMP, off-channel mining would be permitted and in-stream mining restricted to channel maintenance. Implementing the OCMP would result in the creation of additional backfilled wet pits in the planning area. Five off-channel long-term mining applications have been submitted to the County for review under the OCMP. Of the 2,211 acres proposed for mining in these applications, roughly 84 percent would be wet pit mines and the remainder would be dry pit mines. Many of the proposed wet pit mines are a contiguous series of excavations that would create, in essence, single reclaimed backfilled pits up to a mile in length.

The OCMP contains policies designed to ensure that groundwater level and flow impacts relating to backfilled pits are minimized, including:

Obj. 3.3-3: Ensure that off-channel surface mines are operated such that surface and groundwater supplies are not adversely affected by erosion, lowering of the water table, and/or contamination.

This Objective would encourage reduction in potential impacts and minimize adverse impacts to hydrology or water quality and is supported by Action 3.4-5 and Performance Standards 3.5-1 and 3.5-2.

Action 3.4-5: Require that surface mining operations demonstrate that proposed off-channel excavations extending below the groundwater level will not adversely affect the producing capacity or water quality of local active wells.

This Action would minimize adverse impacts to hydrology and/or water quality. This Action is supported by Performance Standards 3.5-1 through 3.5-6, 3.5-10, and 3.5-11. The Performance Standards relating specifically to groundwater levels and flow (the subject of this impact) are discussed below (the Performance Standards relating to groundwater quality are discussed in Impact 4.4-2 of this EIR).

PS. 3.5-1: The area of backfilled off-channel excavations extending below the groundwater level should be minimized in order to reduce changes to groundwater flow. Backfilled pits should be oriented with regard to the direction of groundwater flow so in order to prevent localized obstructions. If a backfilled off-channel excavation were proposed to penetrate either fifty (50) feet or one-half (½) into the saturated thickness of the shallow aquifer then prior to the commencement of excavation below the water table, the applicant should demonstrate in a manner consistent with the Technical Studies that the pit design would not adversely affect active off-site wells within one-thousand (1,000) feet of the proposed pit boundary. If the application included a series of backfilled pits, then the applicant should also demonstrate that the cumulative effects of the multiple backfilled pits will not adversely affect groundwater flow, if there were any active off-site wells within one-thousand (1,000) feet of the pit boundaries.

The performance standard lacks specificity regarding the mathematical model (such as MODFLOW) to be used to simulate altered flow conditions, the criteria for determining the level of significance of impacts, and how the modeling would be evaluated and reviewed.

PS. 3.5-2: Under no circumstances shall any operator of an off-channel excavation use dewatering as a part of the surface mining operation.

This Performance Standard would minimize adverse impacts to hydrology and/or water quality. Dewatering of pits could cause regional reduction in groundwater levels and failure of nearby domestic and/or municipal wells.

Alternative 1a - No Project (Existing Conditions)

Under this alternative, mining would continue in a manner similar to current practices. The majority of aggregate within the planning area is currently extracted from within the Cache Creek channel. However, several off-channel mining operations are currently permitted. This alternative could result in localized impacts to groundwater levels and flow, but those impacts were evaluated and mitigation measures provided for in previous approvals.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

The impacts for this alternative would be similar to those of Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. No additional backfilled wet pits would be created, and therefore additional impacts to groundwater levels and flow would not be generated.

Alternative 3 - Plant Operation Only (Importation)

The impacts for this alternative would be similar to those of Alternative 2.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Under this alternative no new backfilled off-channel wet pits would be created, and therefore additional impacts to groundwater levels and flow would not be generated.

Alternative 5a - Decreased Mining (Restricted Allocation)

Under this alternative, off-channel mining would be limited to no more than 2.3 million tons annually over fifty years. In-stream mining would cease. The result of implementing this policy would be an increased number of backfilled wet pits in the planning area, potentially impacting groundwater levels and flow.

Alternative 5b - Decreased Mining (Shorter Mining Period)

The impacts for this alternative would be similar to those of the OCMP.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Under this alternative, permanent wet pit lakes would not be permitted; virtually all mined lands would be reclaimed to agriculture. It is likely that under this requirement, numerous temporary wet pits would be created and then reclaimed by backfilling, potentially impacting groundwater levels and flow. This alternative would have the greatest potential for impacting groundwater levels and flow since it has the potential for the most backfilled pits.

Mitigation Measure 4.4-1a (OCMP, A-5a, A-5b, A-6)

Performance Standard 3.5-1 included in the OCMP should be as follows to reduce the potential impacts associated with backfilled pits.

Performance Standard 3.5-1: The area of backfilled off-channel excavations extending below the groundwater table shall be minimized to reduce changes to groundwater levels and flow. Backfilled pits shall be oriented with regards to the direction of groundwater flow so in order to prevent localized obstructions. If a backfilled off-channel excavation were proposed to penetrate either fifty (50) feet or one-half (½) into the saturated thickness of the shallow aquifer, then at least six months prior to the commencement of excavation below ~~the water table~~ average high groundwater level the applicant shall demonstrate in a manner consistent with the Technical Studies, that the pit design would not adversely affect active off-site wells within one-thousand (1,000) feet of the proposed pit boundary. If the application included a series of backfilled pits, then the applicant shall also demonstrate that the cumulative effects of the multiple backfilled pits will not adversely affect groundwater flow, if there were any active off-site wells within one-thousand (1,000) feet of the pit boundaries.

The applicant shall demonstrate, using MODFLOW,[16] that the proposed pit design will not adversely impact active off-site wells within 1,000 feet of the proposed pit boundary. An effect shall be considered adverse if the reduction in simulated groundwater levels exceeded two feet at any well located within 1,000 feet of the pit boundary or resulted in well failure. Average, historic low groundwater levels, which represent the condition of maximum threat to water levels in the subject well, shall be used for this simulation. If an adverse impact were identified by the MODFLOW simulation, the mining and reclamation plan will be modified or the applicant shall submit a written agreement that the well owner has agreed to relocate or redesign the well (at no expense to the County).

In addition, the following performance standards measures should be added to the OCMP:

3.5-16 *Site-specific aquifer testing shall be conducted, if needed, to determine aquifer properties for the required modeling.*

3.5-17 *A well survey shall be conducted and all wells within 1,000 feet of the limits of mining plotted on a scaled map. Each property owner owning a parcel(s) within 1,000 feet of the proposed limits of mining shall be contacted and queried about wells that may be located near the mining area.*

Implementation of this mitigation would reduce this impact to a less-than-significant level for the OCMP and Alternatives 5a, 5b, and 6.

[16]MODFLOW is a three-dimensional finite difference model used to simulate groundwater flow. A three-dimensional model would be necessary since aquifer permeability would vary with depth after reclamation.

Mitigation Measure 4.4-1b (A-1a, A-1b, A-2, A-3, A-4)

None required.

Existing mining projects, evaluated under previous CEQA review, would continue under Alternatives 1a and 1b. Alternatives 2, 3, and 4 would generate no additional impact associated with groundwater levels and flow since no new backfilled pits would be permitted, and therefore mitigation would not be required.

Impact 4.4-2
Potential Degradation of Water Quality During Aggregate Mining and Reclamation

In-channel and/or off-channel aggregate extraction within the planning area may result in mining below the water table. Mining below the water table results in the creation of wet pits, which tend to be more susceptible to water quality degradation than a groundwater system because the groundwater would be exposed at the surface. The soil and fine-grained deposits that cover an aquifer provide some protection to groundwater quality from chemical inputs. A wet pit, which exposes groundwater at the surface, has no such buffer to chemical inputs.

Potential sources of water quality degradation associated with wet pits include: chemical release from mining equipment, agricultural runoff into the pits, eutrophication,[17] flood water mixing, illegal dumping/sabotage, and bioaccumulation of mercury in flora and fauna within the pits. Chemical releases from mining equipment and agricultural runoff into the pits are considered mining and reclamation period impacts, and are considered below. Eutrophication, flood water mixing, and illegal dumping/sabotage are discussed in Impact 4.3-3. Bioaccumulation of mercury is discussed in Impact 4.4-3.

Chemical Releases from Equipment

Operation of mining equipment within and near wet pits exposes surface and groundwater to water quality impacts from potential chemical spills (fuels, lubricants, and hydraulic oil) from mining and reclamation equipment. Refueling and maintenance of the equipment would be required on a regular basis.

The regulatory framework and required actions regarding the storage and emergency response to chemical releases is discussed in the Hazards Section of this EIR. The potential long-term impacts to groundwater quality resulting from chemical releases are discussed in this section.

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[17]Eutrophication is defined as the loading of inorganic and organic dissolved and particulate matter to lakes and reservoirs at rates sufficient to increase the potential for high biological production. For further discussion, see Impact 4.4-3.

The potential impacts associated with a petroleum fuel hydrocarbon release to an open wet pit lake were simulated using mathematical modeling techniques (Luhdorff and Scalmanini, et al., 1996). Two models (MODFLOW and MT3D) were used to evaluate the fate of five gallons of gasoline discharged directly to the wet pit lake. The lake used in the simulation had an 80-acre surface area and a depth of 60 feet. After 5.5 years, the leading edge of the contaminant plume had migrated 325 feet downgradient of the wet pit. These modeling results are in general agreement with the results of a recent statewide evaluation of the mobility of fuel hydrocarbons in the subsurface conducted by the Lawrence Livermore National Laboratory (LLNL, 1995). The LLNL report also indicated that fuel hydrocarbons have limited impact on human health, the environment, and California's groundwater resources.

Agricultural Tailwater and Runoff

The dominant land use in the planning area is agriculture, and therefore, in most cases, the wet pits would be located near or adjacent to agricultural crops. Irrigation tailwater and storm water runoff tends to drain from agricultural fields toward low-lying areas. The wet pits would represent large low-lying areas. Runoff and tailwater from agricultural fields may contain residual pesticides, organic material, and sediment. If allowed to drain into the wet pits the tailwater could adversely impact groundwater quality.

<u>Draft OCMP and Implementing Ordinances</u>

Under the OCMP, off-channel mining would be encouraged over in-stream mining. This would increase the number of wet pits in the planning area. Five off-channel long-term mining applications have been submitted to the County for review under the OCMP. Of the 2,211 acres proposed for mining in these applications, roughly 84 percent would be wet pit mines and the remainder would be dry pit mines. This would result in long-term exposure of wet pits at numerous locations. As part of the mining and reclamation processes, excavators, loaders, scrapers, dragline cranes, motorized boats, and haul trucks would be operated for tens of thousands of hours in and around mining areas where groundwater is likely to be exposed in wet pit lakes. It is almost a certainty that a release of fuel, lubricants, and/or hydraulic oil will occur at some time during mining and reclamation activities.

The OCMP contains policies designed to address potential impacts to groundwater quality associated with wet pits, including:

Goal 3.2-2: Maintain the quality of surface and groundwater so that nearby agricultural productivity and available drinking water supplies are not diminished.

Obj. 3.3-3: Ensure that off-channel surface mines are operated such that surface and groundwater supplies are not adversely affected by erosion, lowering of the water table, and/or contamination.

Action 3.4-3: Include a groundwater monitoring program as a condition of approval for any surface mining operation that proposes off-channel excavations that extend below the groundwater level. The monitoring program shall require regular groundwater level data, as well as annual test for water quality based on a developed set of standards.

These policies would minimize adverse impacts to hydrology and/or water quality.

Action 3.4-4: Designate staff to begin compiling and coordinating the monitoring information generated by the off-channel mining operations, in order to form the foundation for preparing an ongoing groundwater data base covering the entire County. The data base should be expanded to include other relevant sources of information, so that it can be used as reference material for the Water Resources Agency and other regional water planning efforts.

The Water Resources Agency (a local consortium of water interest groups) is not the only agency that may wish to be involved in compiling and coordinating monitoring data. Other agencies may have jurisdiction and/or legitimate stake in the implementation of the monitoring program.

Action 3.4-5: Require that surface mining operations demonstrate that proposed off-channel excavations extending below the groundwater level will not adversely affect the producing capacity or water quality of local active wells.

This Action would minimize adverse impacts to hydrology and/or water quality. This Action is supported by Performance Standards 3.5-4 and 3.5-6.

PS. 3.5-3: Surface water shall be prevented from entering mined areas, through perimeter berms or ditches and grading. Appropriate erosion control measures shall be incorporated into all surface drainage systems.

This Performance Standard is not adequately specific to protect water quality. During intense storms, when rainfall rates greatly exceed infiltration rates, runoff will occur. The runoff must be drained to nearby creeks or conveyances or collected in low-lying areas or detention basins. In the case of poor quality runoff (runoff that may contain residual pesticides, nutrients, and sediment), protection of surface water and groundwater quality and protection from flooding may be contradictory goals.

Berms and ditches may be inadequate long-term mitigation to prevent runoff into the pits. In the long-term, berms may be broken down by biological activity and erosion and ditches may become filled with sediment and debris. A long-term inspection and maintenance program for the berms and ditches may not be practical.

PS. 3.5-4: All surface mining operations that propose off-channel excavations extending below the groundwater level shall develop and maintain a groundwater monitoring program. At a minimum, the program shall consist of three (3) monitoring wells, one upgradient of the wet pit and two downgradient. Monitoring wells shall be installed at least six (6) months prior to excavation below the groundwater level. The water level shall be recorded and a water quality test performed for all monitoring wells and submitted to the County prior to the commencement of wet pit mining. The test results shall provide baseline data for future comparison and analysis.

Once wet pit mining has commenced, groundwater levels shall be monitored quarterly, while groundwater quality shall be monitored annually. The analysis of groundwater quality shall include, but may not be limited to, the following: mineral constituents, nitrate, pH, electrical conductivity, turbidity, and total coliform. A report to the County shall be submitted annually regarding the results of the groundwater monitoring program.

This Performance Standard may not provide sufficient monitoring requirements, does not specify the required duration of monitoring after the completion of mining, or provide details on monitoring requirements for a series of wet pits. The turbidity analysis required under Performance Standard 3.5-4 should be eliminated. The level of turbidity of groundwater sample from a monitoring well is more a function of well design and sampling methods than actual turbidity of groundwater in the aquifer.

PS. 3.5-5: At least one toilet shall be provided for each off-channel mining operation. Chemical toilets shall be properly maintained and serviced regularly. Permanent toilets shall be properly engineered and the design approved by the Yolo County Building Official prior to installation. All on-site water storage facilities shall be labeled "potable" or "non-potable."

This Performance Standard would minimize adverse impacts to hydrology and/or water quality. This Performance Standard would help to ensure that septage is not introduced to wet pits.

PS. 3.5-6: If any off-channel excavation proposes to extend below the groundwater level, then six months prior to the commencement of excavation below the water table, the applicant shall demonstrate in a manner consistent with the Technical Studies that the pit is sufficiently set back from any active drinking water wells within one-thousand (1,000) feet of the proposed pit boundaries, in order to ensure that potential groundwater contamination is prevented.

This Performance Standard requires evaluation of all wells within 1,000 feet of proposed pit boundaries. The technical studies differentiate setbacks between domestic wells (500 feet) and municipal wells (1,000 feet). The performance standard is appropriately conservative to protect drinking water quality. However, it does not provide sufficient detail to allow practical implementation.

PS. 3.5-8: No wastewater shall be directly discharged to Cache Creek. Sediment fines generated by aggregate processing shall either be used for agricultural soil enhancement or shall be placed in settling ponds, designed and operated in accordance with all applicable regulations, and used for backfill materials in off-channel excavations. Agricultural tailwater shall be diverted to catchment basins prior to its release to the creek.

This Performance Standard addresses discharges associated with aggregate processing and agricultural runoff. Insufficient detail regarding diversion of agricultural tailwater is provided. Management of agricultural runoff is more thoroughly discussed under the revised Performance Standard 3.5-3 in the mitigation section.

Alternative 1a - No Project (Existing Conditions)

Under this alternative, mining would continue at existing sites under current practices. The majority of aggregate within the planning area is currently extracted from within the Cache Creek channel. However, several off-channel mining operations are currently permitted. The potential for impacts to groundwater quality for the existing permits was mitigated under previous CEQA analysis.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

The impacts from this alternative are similar to those of Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. The potential for chemical releases from mining equipment and discharge of agricultural tailwater to new wet pits would be eliminated.

Alternative 3 - Plant Operation Only (Importation)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. The potential for chemical releases from mining equipment and discharge of agricultural tailwater to new wet pits would be eliminated. Operation at the processing plants could continue and chemical releases could occur at those locations. However, processing plants are generally located at some distance from open water bodies and established surface water courses, and therefore would not pose a significant threat to regional groundwater quality.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Under this alternative no new off-channel wet pits would be created, and therefore potential impacts to groundwater quality associated with chemical releases to wet pits would be eliminated. However, under this alternative, much of the unsaturated zone would be removed during excavation, reducing the effectiveness of the soil buffer in mitigating chemical releases to the surface.

Alternative 5a - Decreased Mining (Restricted Allocation)

Under this alternative, off-channel mining would be encouraged over in-stream mining. The result of implementing this policy would be an increased number of wet pits in the planning area, potentially impacting groundwater quality.

Alternative 5b - Decreased Mining (Shorter Mining Period)

The impacts for this alternative would be similar to those of the OCMP Alternative.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Under this alternative, permanent wet pit lakes would not exceed 20 percent of the total reclaimed areas; virtually all mined lands (80 percent) would be reclaimed to agriculture. However, under this alternative, numerous temporary wet pits would be created during mining and backfilled during the reclamation period. Water quality impacts could occur during the mining and reclamation period.

Mitigation Measure 4.4-2a (OCMP, A-5a, A-5b, A-6)

Mitigation of potential water quality impacts would be addressed as described in the flowchart presented as Figure 4.4-10. The OCMP and implementing ordinances should be modified as described below.

Pollution Prevention

Performance Standard 3.5-6 of the OCMP and the associated ordinance should be modified as follows:

If any off-channel excavation proposes to extend below the level of seasonal high groundwater ~~level~~, then six months prior to the commencement of excavation below the ~~water table~~ average high groundwater level the applicant shall ~~demonstrate in a manner consistent with the Technical Studies that the pit is sufficiently set back from any active drinking water wells within one-thousand (1,000) feet of the proposed pit boundaries in order to ensure that potential groundwater contamination is prevented~~. identify and locate all off-site wells within 1,000 feet of the proposed mining boundary. If active wells are identified, well characteristics (pumping rate, depth, and locations of screens) shall be determined. If wells are not located within 1,000 feet, the pre-mining impact evaluation will be considered complete.

If mining is proposed within 1,000 feet of a municipal water supply or within 500 feet of a domestic water supply well, a capture zone analysis shall be conducted using the U.S. Environmental Protection Agency model WHPA. The simulation shall assume 30 days of continuous pumping of the water supply well (at its maximum probable yield) under analysis. A mining setback shall be established so that the capture zone and the pit do not coincide. Alternatively, the applicant shall submit a written agreement that the well owner has agreed to relocate or redesign the well (at no expense to the County). The analysis shall be prepared and signed by a Registered Professional Engineer or Certified Hydrogeologist and submitted to the County for review and shall be submitted to, and approved by, the County at least six months prior to commencement of excavation below the seasonal high groundwater level.

Any new drinking water wells proposed for installation within 1,000 feet of a proposed wet pit mining area shall be subject to review by the Yolo County Environmental Health Department. The County shall determine, based on site-specific hydrogeology and available water quality data, whether to approve the proposed well installation.

The County may retain appropriate staff or contract consultant to provide third party critical review of all hydrogeologic reports related to mining applications.

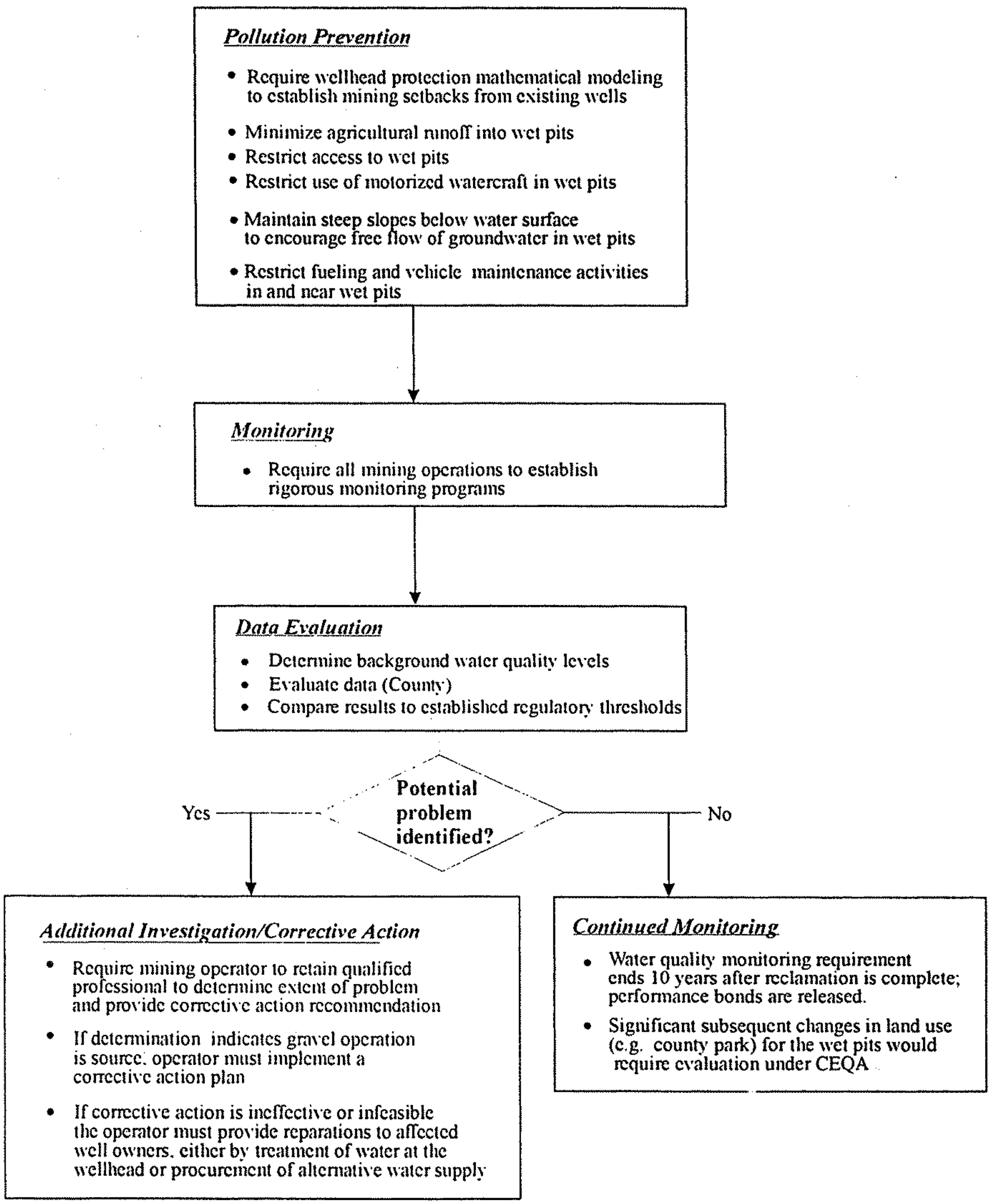

Figure 4.4-10 Water Quality Evaluation and Mitigation Flowchart

Performance Standard 3.5-3 of the OCMP and the associated ordinance should be replaced with the following Performance Standard:

> Surface water shall be prevented from entering mined areas, through perimeter berms or ditches and grading. Appropriate erosion control measures shall be incorporated into all surface drainage systems. Drainage and detention facilities within the proposed mining areas shall be designed to prevent discharges to the wet pits and surface water conveyances (i.e., creeks and sloughs) from the 20-year/1-hour storm or less. For events greater than the 20-year/1-hour storm, runoff should be directed into surface water conveyances. Drainage plans shall not rely solely on ditches and berms to direct runoff away from the wet pit. Without proper maintenance, berms and ditches may deteriorate with time and become ineffective. Drainage plans shall emphasize grading of disturbed areas that results in broad gentle slopes that drain away from the pits. Grading plans shall be reviewed by the County to evaluate compliance with drainage plan objectives prior to project approval.
>
> In addition, a restriction shall be recorded on the deed that requires berms and ditches be permanently maintained in a condition consistent with the final approval. The deed restriction shall require inspection of the berms and ditches by a registered geologist or professional engineer every five years after completion of reclamation. An inspection report including recommendations for corrective action, if needed, shall be submitted to the Yolo County Community Development Agency following each inspection. The property owner shall be required to implement recommended corrective action, if any. In addition, an inspection easement (which allows County staff or other authorized personnel) to inspect the ditches and berms shall be recorded on the deed.

Performance Standard 2.5-8 of the OCMP and the associated ordinance should be modified as follows:

> Unnecessary personnel shall be excluded from off-channel excavations. Open wet pits shall be fenced with a four strand barbed wire fence or the equivalent, prior to the commencement of excavation, during excavation, and during reclamation. Fencing may enclose the property of which mining is a part, the mining site, or both. In addition, signs shall be installed at the project site boundaries and access road, indicating that the excavation area is ~~a danger zone~~ restricted. Additional security (e.g., gates with protected locks and wing fences to prevent drive-arounds) shall be provided at all vehicular access routes. The fencing and gates shall be maintained throughout the mining and reclamation period and after completion of reclamation. A requirement shall be recorded on the deed of the property which requires the landowner to maintain fences and gates.

The potential for water quality degradation resulting from operation of motorized watercraft is adequately mitigated by Performance Standards 3.5-10 and 2.5-8.

Maintaining steep slopes below the groundwater table in the wet pits would discourage "clogging" of the aquifer and encourage the free flow of groundwater into and out of the wet pits. Groundwater flow would continuously "freshen" the water and reduce the potential for eutrophication of the wet pit lakes, or if it does occur, reduce the severity.

The potential for eutrophication of the wet pit lakes would be adequately mitigated by Performance Standards 2.5-18 and 3.5-11 (discussed in Impact 4.4-3).

Mitigation of potential releases from mining equipment and vehicles in and near the wet pits is adequately addressed in the Hazards section of this EIR.

Performance Standard 2.4-11 of the OCMP and associated ordinance should be deleted.

Monitoring

Performance Standard 3.5-4 of the OCMP and the associated ordinance should be modified as follows:

> All surface mining operations that propose off-channel excavations extending below the groundwater table shall develop and maintain a groundwater monitoring program consisting of two components: water level measurements and water quality testing. A groundwater level monitoring program shall be initiated at least six months prior to removal of overburden. At a minimum, the groundwater level monitoring program shall consist of three monitoring wells, with at least one well upgradient of the wet pit and one well downgradient of the wet pit. Monitoring programs for proposed mining areas exceeding 100 acres (total proposed mining area over the life of the project) shall include one additional well for each 100 acres to be mined. Therefore, proposed mining areas of 1 to 99 acres would require 3 wells, 100 to 199 acres would require four wells, 200 to 299 acres would require 5 wells, and so on. These wells shall be distributed through the vicinity of the proposed mining area and used for groundwater level measurements. Groundwater levels shall be collected from the monitoring wells on a quarterly basis for six months prior to mining and for the duration of the mining period. All wellheads shall be surveyed with horizontal and vertical control to allow calculation of groundwater elevations and development of groundwater contour maps. Groundwater levels shall be measured with an accuracy of plus or minus 0.01 foot, at minimum.
>
> Water quality in the vicinity of each active wet pit mining location would be evaluated by analyzing samples from selected monitoring wells (one upgradient and one downgradient) and wet pit surface water sampling locations. Since mining would be conducted in phases over a relatively long period of time, pit boundaries would change with time. Selection, and installation if necessary, of downgradient monitoring wells, which would be critical to adequately characterize the groundwater quality in the vicinity of the wet pits, would be proposed by the applicant for review and approval by the County. The selected monitoring wells shall be installed and sampled at least six months prior to removal of overburden. The downgradient wells should be located as near to active wet pit mining areas as is practical. The upgradient wells should be located an adequate distance from the proposed mining area to ensure that effect of the wet pit on water quality in the well would be negligible. The water samples from the wet pit should be collected in a manner to ensure that they are representative of water quality within the wet pit. The minimum sampling schedule and required analyses are described below.
>
> Groundwater level and pit water surface level measurements:
>
> Quarterly in all wells for the duration of mining and reclamation
>
> For proposed wet pit mining, sample collection and analysis of physical, chemical, and biological constituents shall be conducted according the following specifications:

- Prior to removal of overburden- One upgradient and one downgradient well shall be sampled at least six months prior to removal of overburden and again at the start of excavation. The samples shall, at minimum, be analyzed for general minerals, inorganics, nitrates, total petroleum hydrocarbons (TPH) as diesel and motor oil, benzene, toluene, ethylbenzene, and xylenes (BTEX), pesticides (EPA 8140 and 8150), and coliform (with E. coli confirmation).

- During wet pit mining and active reclamation- The wet pit shall be sampled semi-annually for the duration of mining and active reclamation. The samples shall, at minimum, be analyzed for general minerals, inorganics, nitrates, TPH as diesel and motor oil, BTEX, pesticides (EPA 8140 and 8150), and coliform (with E. coli confirmation).

  One upgradient, and one downgradient wells shall be analyzed, at minimum, for general minerals, inorganics, nitrates, TPH as diesel and motor oil, BTEX, pesticides (EPA 8140 and 8150), and coliform (with E. coli confirmation). The wells shall be sampled according to the following schedule:

  0-2 years: Semi-annually

  2 years to completion of reclamation: Annually

- After active reclamation- After all heavy equipment work has been completed in the vicinity of the pit, the TPH and BTEX analyses may be discontinued. The wet pit, one upgradient, and one downgradient well shall be sampled and analyzed for pH, temperature, nutrients (phosphorus and nitrogen), total dissolved solids, total coliform (with E. coli confirmation), and biological oxygen demand. This monitoring shall be conducted every two years for a ten year period after completion of reclamation.

A report to the County Community Development Agency and Department of Environmental Health shall be submitted ~~annually regarding the results of the groundwater monitoring program~~ within 30 days of the required groundwater testing.

If, at the completion of the mining and reclamation period, water quality has not been impacted, all monitoring wells shall be destroyed in accordance with California Department of Water Resources Well Standards (DWR, 1991). If the County or other agency wishes to maintain the wells for future water resources evaluation, selected wells could be preserved for this use.

The County may retain appropriate staff or contract consultant to provide third party critical review of all hydrogeologic reports related to monitoring.

Data Evaluation/Corrective Action

The following Performance Standard should be added to the OCMP and implementing ordinance.

PS. 3.5-16: A performance bond shall be acquired to ensure that monitoring continues through the mining period and ten years after the completion of reclamation.

Action 3.4-4 of the OCMP should be modified as follows:

The Yolo County Community Development Agency shall designate staff to ~~begin compiling and coordinating the monitoring information generated by the off-channel mining operations, in order~~

~~to form the foundation for preparing an ongoing groundwater database covering the entire County~~ coordinate with City, County, regional, and State agencies that may wish to receive copies of data generated from the off-channel mining operations, including the towns of Capay, Esparto, Yolo, and Madison, the city of Woodland, and the Yolo County Flood Control and Water Conservation District, the Water Resources Agency, the Central Valley Regional Water Quality Control Board, and the California Department of Water Resources. The data base shall be expanded to include other relevant sources of information, so that it can be used as reference material for ~~the Water Resources Agency and other~~ regional water planning efforts.

If at any time during the monitoring period, testing results indicate that sampling parameters exceed Maximum Contaminant Levels (MCLs), as reported in the California Code of Regulations, or established background levels, a qualified professional shall evaluate potential sources of the contaminants. The evaluation shall determine the source and process of migration (surface or subsurface) of the contaminants. A report shall be submitted to the regulatory agencies (Yolo County Community Development Agency and the Central Valley Regional Water Quality Control Board) which identifies the source of the detected contaminants and specifies remedial actions to be implemented by the applicant for corrective action. If it is determined that the source of water quality degradation is off-site, and County and RWQCB are in agreement with this conclusion, the applicant shall not be responsible for corrective action.

If corrective action is ineffective or infeasible, the responsible party must provide reparation to affected well owners, either by treatment of water at the wellhead or by procurement of alternate water supply.

Analysis of environmental impact for projects in the vicinity of the wet pits shall include consideration of potential water quality impacts on the open water bodies.

Implementation of these mitigation measures would reduce this potential impact to a less-than-significant level for the OCMP and Alternatives 5a, 5b, and 6.

Mitigation Measure 4.4-2b (A-1a, A-1b, A-2, A-3, A-4)

None required.

Current mining projects under Alternatives 1a and 1b would continue under existing approvals (no impact). Alternatives 2, 3, and 4 would generate no new wet pits, and therefore mitigation would not be required.

Impact 4.4-3
Potential Degradation of Water Quality after Reclamation of Mined Lands

Mining below the water table may occur within the planning area, creating wet pit lakes. Reclamation plans may include leaving wet pit lakes as permanent features. The potential long-term water quality impacts associated with wet pit lakes are described below.

Eutrophication/Biological Degradation

Eutrophication is defined as the loading of inorganic and organic dissolved and particulate matter to lakes and reservoirs at rates sufficient to increase the potential for high biological production. Eutrophication could occur during the mining period, but is considered more likely to occur over the long term, especially if the sidewalls of the pit potentially become clogged with fine-grained sediments or biological matter. Eutrophic lakes tend to have colored water (green/brown), high algae content, and very low dissolved oxygen content. Eutrophication can be exacerbated by introduction of nutrients from agricultural operations, poorly designed and/or sited septic systems, and municipal wastewater treatment systems.

A wet pit that penetrates the groundwater table would be continually "freshened" by groundwater flow through the sidewalls, and would therefore not be significantly susceptible to stagnation (David Keith Todd, 1995). The free flow of groundwater could be reduced by clogging of the sidewalls (sedimentation or biological clogging), resulting in a pit more susceptible to eutrophication. Maintaining steep slopes would reduce the potential for clogging, but may conflict with the conditions necessary for high value biotics habitat and result in hazards to the public. Biotics require gentler slopes and broad shallow water areas. Gentle slopes and increased biological activity could increase the potential for eutrophication.

Establishment of habitat in the wet pits during and after the reclamation period could introduce additional sources of water quality degradation. These sources may include: 1) fecal material from animals (waterfowl, small mammals, and fish) that may contain microbiological contaminants, 2) surface scum (floating planktonic cells, colonies and filaments of algae), and 3) rooted plant biomass, including nuisance plants.

The following conclusions were made by Bruce Macler, the manager of the development of the Groundwater Disinfection Rule with the USEPA, about potential biological water quality impacts associated with wet pit mining along Cache Creek (Macler, 1996b):

> The types of plants and animals discussed above do not represent a source of contamination that would adversely impact drinking water supplies. The primary source of microbial contamination of surface and groundwater supplies is fecal material from humans and other large mammals. The only known microorganism that waterfowl carry and could introduce in small quantities into the wet pits is avian sarcoma, a virus with very little potential for transport in an alluvial aquifer. It is far more likely that domestic and municipal groundwater supplies would be impacted by nearby septic systems than a wet pit lake that supports no livestock grazing or human recreation.

Nearly all research on persistence and transport of pathogens in water begins with a source of the pathogens (i.e., a cesspool, cattle feedlot, sewage sludge application area). Required or recommended setbacks[18] established by the USEPA (1987) and the California Department of Water Resources (1991) are based on a concentrated source of pathogens. As discussed above, wet pit gravel mining and proposed reclamation would not result in creation of this type of a source. To further demonstrate that an alluvial aquifer has considerable ability to filter potential pathogen-containing water, data from another wet pit mining area are described below.

[18] Setbacks require that drinking water supply wells are installed at a given distance from a contaminant source, typically 100 to 400 feet, to protect public health from pathogens.

Wet pit gravel mining has been conducted within the Middle Reach of the Russian River since the 1960s (EIP, 1994). The aquifer underlying the Russian River system is similar to the aquifer underlying Cache Creek. Both are composed primarily of sand and gravel near the channel with silt and clay content increasing with distance from the thalweg. Both aquifers experience significant seasonal groundwater level fluctuation and both are used as a primary drinking water source.

Mining of the Basalt Pit, located within the Middle Reach within 200 feet of the active channel of the Russian River and approximately 1 mile south of the City of Healdsburg, was initiated in 1967. The City of Healdsburg Wastewater Treatment Plant began discharging secondarily treated wastewater into the Basalt Pit in 1972. The long-term average discharge is approximately one million gallons per day (Robertson, 1996). The Basalt Pit is highly eutrophic (BASELINE, 1992). Surface and groundwater quality has been monitored on a quarterly basis in the vicinity of the Basalt Pit since 1992. Monitoring indicates that the pit water contains total and fecal coliform, often exceeding 700 MPN.[19] Samples collected from the nearest downgradient monitoring well (located within 50 feet of the pit) typically contain no total coliform or low levels (ranging from 2.1 to 64 MPN). Fecal coliform at 1.1 MPN has been detected on only one occasion in the monitoring well(Robertson, 1996). These data indicate that the area of water quality degradation resulting from microorganisms in the vicinity of the eutrophic wet pit is limited to a relatively short distance from the pit boundary.

Eutrophication and establishment of habitat in the reclaimed wet pits may reduce groundwater quality in the aquifer near the pits. However, a significant pathogen source would not be present. This potential source of water quality impact is considered less than significant.

Flood Water Mixing

Flood waters that overtop alluvial separators (which would happen only during a storm with magnitude greater than the 100-year event since 100-year flood protection is a condition of approval for all off-channel mining projects) would likely mix with water in the wet pits. Flood water can contain contaminants, including untreated or partially treated sewage, petroleum hydrocarbons, and heavy metals. Mixing of flood water with the wet pits could impact water quality in the aquifer near the pits, however this is considered a low probability impact (chance of occurrence is one percent in any given year) and only moderately exacerbated by the presence of the pits. Temporary impacts to shallow groundwater quality would occur whether the pits were present or not. This potential source of water quality impact is considered less than significant without mitigation.

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[19] MPN means "most probable number" and is a statistical technique for determining the presence of coliform.

Illegal Discharge of Chemicals

It is possible that wastes and/or chemicals could be illegally discharged or dumped into the wet pits during the mining and/or reclamation period or after reclamation is complete. It is considered less likely that illegal discharges would occur during the mining and reclamation period because mining and processing personnel would represent a high profile presence. BASELINE conducted an informal survey of several agencies[20] in California that are involved with water quality issues and wet pits created by mining. None of these agencies reported knowledge of any illegal dumping or discharges to wet pits within their jurisdiction. Nevertheless, illegal dumping could occur during mining, the reclamation period, or after reclamation is complete. It is anticipated that the most significant impact would result from a large amount of chemical or waste transported to the wet pit lake by a car or truck. It seems unlikely that a sufficient quantity of material to cause a significant impact would be carried on foot to the lake.

An illegal discharge, depending on the type of chemical and quantity, could cause a significant adverse impact to groundwater quality in the vicinity of the wet pit and downgradient of the discharge. This source of water quality impact is considered significant.

Discharges from Motorized Watercraft

After the completion of mining and reclamation, it is possible that the wet pit lakes could be used for recreational purposes, either legally or illegally. Legal recreational use could result if the lakes were made available to the public (i.e. county park) or private use by permission of the property owner. Illegal recreational users could access the lakes by trespassing. Discharges of fuel, lubricants, and/or bilge water could result in degradation of water quality in the lakes. If this type of discharge occurred on a regular basis, it is possible that groundwater quality in the aquifer adjacent to the wet pit could be impacted. This source of water quality impact is considered significant.

Infiltration of Agricultural Waters

Under the existing condition, the ground surface, where infiltrating rainfall and irrigation waters enter the subsurface, is approximately 10 to 75 feet above the groundwater table. Under some potential mining scenarios, the post reclamation ground surface would be lowered and, therefore, be nearer to the groundwater table, reducing the thickness of the unsaturated zone. Water percolating through soils and sediment is generally improved in quality as organic chemicals are adsorbed to soil particles. Reducing the thickness of this

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[20]The agencies contacted included: the Central Valley Regional Water Quality Control Board, Yuba County Planning Department, Fresno County Public Works, Zone 7 (Alameda County), California Department of Water Resources, Humboldt County Planning Department, San Benito County Planning Department, Tulare County Planning and Development Department.

"filter" may reduce its capacity to remove contaminants such as herbicide and pesticide residues from the infiltrating water, reducing groundwater quality.

A scenario was developed using mathematical modeling to evaluate the potential for pesticides to leach through the unsaturated zone and reach the groundwater table (Luhdorff and Scalmanini, et al., 1996). Atrazine was selected as the pesticide to use in the simulation because it is applied to crops in the planning area and is an identified "leacher" (a compound with high leaching potential relative to other similar compounds). An unsaturated zone with a thickness of 10 feet was used in the simulation to represent pre-mining conditions. The results indicated that atrazine concentrations were significantly reduced by processes in the unsaturated zone. However, after 900 days, atrazine reached the water table in concentrations greater than the USEPA maximum contaminant level.

An unsaturated zone thickness of five feet was used in a second simulation to represent post reclamation conditions. In the post reclamation scenario, the model indicates that the reduced unsaturated zone thickness is essentially offset by the reduction in grain size which would result from proposed mining and reclamation activities.

Topsoil formerly in agricultural production may be used to provide a growing medium for reclamation plantings around the reclaimed pits. These soils may contain residual concentrations of persistent pesticides and/or herbicides (e.g., DDT, DDE). Rainfall may leach detectable concentrations of these chemicals into the wet pits, degrading water quality.

Bioaccumulation of Mercury

Mercury, a silver-white liquid metal in its elemental form, is a potential environmental pollutant. Mercury is a potent neurotoxin, capable of causing brain damage in developing fetuses and mild tremors and emotional disturbances in adults exposed to sufficient concentrations. Compounds of mercury can also be harmful to health. Organic mercury compounds, including methylmercury, are rapidly accumulated by aquatic animals. The concentration of these compounds increases through time in the flesh of fish (bioaccumulation). In addition, the accumulation of organic mercury concentrates along aquatic food chains, reaching high levels at the top predators through a process referred to as biomagnification. Consumption of fish with bioaccumulated levels of methylmercury is the largest source of mercury exposure for humans.

The Cache Creek watershed drains areas of the Clearlake Highlands and presents the potential for significant levels of mercury in sediment and water resources. Mercury-bearing ores are primarily found within the Cenozoic Clear Lake Volcanics bedrock within the north-central Coast Ranges but are also found in extremely deformed Franciscan bedrock within the region. Most of the mercury deposits are formed as epithermal (low temperature, low pressure) deposits of sulfide ores, including cinnabar. These deposits have been historically mined within the region and have produced a large percentage of mercury mined within the United States.

Recent water quality sampling performed by the Central Valley Regional Water Quality Control Board (Foe, 1996) indicates that floodwaters sampled from Cache Creek during 1995 and 1996 contain significant levels of mercury. Unfiltered water samples collected just upstream of the town of Rumsey contained total mercury at levels between 1,000 to 4,000 nanograms (10^{-9} grams) per liter (parts per trillion). These levels were considerably higher than mercury levels measured in samples collected upstream on Cache Creek, downstream of Clear Lake, and on the North Fork of Cache Creek downstream of Indian Spring Reservoir. The levels at Rumsey were also higher than the levels measured in Bear Creek. These data indicate a potential source of elevated mercury between the confluences of the North Fork (upstream) and Bear Creek (downstream) with Cache Creek. The suspected source is probably an unidentified abandoned mercury mining operation within the watershed of one of the smaller creeks entering this reach of Cache Creek (Foe, 1996).

The availability of mercury within the Cache Creek watershed, both naturally-occurring as bedrock deposits and from mercury mining and processing facilities, indicates that the alluvial sediments within the OCMP planning area may contain significant levels of mercury. The mercury within these deposits is likely inorganic forms of mercury, including fragments of mercury sulfide deposits and mercury adsorbed to clay particles. Soils developed on these deposits may also contain mercury. In particular, the organic surface (A-horizon) soils are likely to contain relatively high levels (compared to deeper sediments) because of the affinity of mercury for forming strong complexes with organic material in these soils.

Under existing conditions, the forms of mercury expected in the sediments would be relatively stable and have low solubility. The mobility of mercury in the subsurface would be limited by the oxidizing environment of the unsaturated zone, neutral to slightly acidic soil conditions, and relatively low temperatures.

Under these existing conditions, the solubility of mercury is low and adverse impacts to groundwater quality would not be expected. The maximum contaminant level (MCL) for mercury for drinking water set forth in the California Code of Regulations is 0.002 milligrams per liter (mg/L). Twenty three groundwater quality samples collected within the OCMP planning area during the period 1992 to 1995 (Luhdorff and Scalmanini, et al.,1996) have not contained mercury above detection limits (0.0002 mg/L). These data indicate that if mercury is present in groundwater, the concentration is more than ten times lower than the drinking water standard.

However, aquatic life is more susceptible to the impact of mercury in water due to the potential for direct exposure to methylmercury. The US Environmental Protection Agency's national ambient (four-day average) water quality criteria to protect freshwater aquatic life for mercury is 0.000012 mg/L. This threshold is, therefore, 167 times lower than drinking water standard.

Methylmercury is formed through "methylation" of inorganic mercury. Methylation occurs primarily as an assimilative process within the cells of organisms which are able to metabolize available mercury compounds. Sulfur-reducing anaerobic bacteria are considered to be the most efficient organisms for methylation of mercury. The conversion of mercury to methylmercury is, therefore, promoted by anaerobic (oxygen-deficient), acidic (low pH) aquatic environments. The rate of methylmercury production is generally controlled by the availability of mercury and the presence of anaerobic bacteria. Although methylmercury is volatile and unstable in the aquatic environment, bioaccumulation of this compound in the tissue of aquatic life and biomagnification of methylmercury in the food chain present potential environmental health impacts in environments where methylmercury forms.

Reclamation of off-channel mining areas within the OCMP planning area to deep, permanent lakes could present conditions favorable to the conversion of mercury to methylmercury. Thermal stratification of lake waters and accumulation of organic matter could promote the development of anaerobic conditions in the bottom of the lakes. Although throughflow of groundwater through the lakes would be expected to reduce the potential for severe eutrophication of the lakes, algal growth and detritus from the margins of the lakes could provide a significant source of organic materials. Deeper portions of the lakes could be deficient in dissolved oxygen. Anaerobic conditions could promote the development of significant anaerobic bacteria populations, capable of converting inorganic mercury to methylmercury.

Although anaerobic conditions could develop within the lakes, the production of methylmercury would be dependent on the availability of inorganic mercury within the lakes. Detection of mercury in the alluvial deposits within the OCMP planning area would be expected due to the presence of mercury within the Cache Creek watershed. However, data are not currently available on the concentration of inorganic mercury within the alluvial sediments in which the lakes would be formed. Although the concentration of total mercury in lake sediments or lake water provides an indication of the availability of mercury for methylation, a direct correlation between the amount of total mercury and the amount of methylmercury within an aquatic system has not been established in studies conducted within the region of the project site (Burau, 1996). Biological organisms may not be able to metabolize all forms of inorganic mercury (which would be measured in total mercury analysis). In addition, specific water quality parameters, such as pH, dissolved oxygen levels, would control the environments necessary for methylation of mercury.

Wet pit mining operations at the Solano Concrete Company's property, located near the center of the OCMP planning area, have been conducted since 1980 under an approved mining permit. Progressive mining of the 100-acre Hutson parcel has created a large open water body. Mining was completed at the parcel in November 1995. Surface water quality samples were collected in the mining pit during three sampling events in 1992, 1994, and 1995. Testing of the water sampled in the pit did not identify total mercury concentrations above the detection limit of 0.0002 mg/L (Luhdorff and Scalmanini, et al., 1996). The US EPA water quality criterion for protection of freshwater aquatic life is 0.000012 mg/L.

These levels are significantly lower than the EPA's recommended maximum short-term (one-hour average) criterion for the protection of aquatic life (0.0024 mg/L).

The pH measurements for the collected samples from the Hutson parcel lake ranged from 8.5 to 8.7, suggesting a consistent moderately alkaline condition for the surface water in the lake. The pH was slightly more alkaline than groundwater samples from wells surrounding the pit. The measured pH of the water would not be conducive to the processes which promote methylation of mercury.

The surface water sampling results from the Solano Concrete Company's wet pit mining operation do not indicate conditions that would promote conversion of mercury to methylmercury. However, the surface water samples collected from an active mining pit would not necessarily be reflective of the chemistry of waters at the bottom of the pit or those in a reclaimed lake. In addition, the availability of inorganic mercury is not accurately known. The expected source of inorganic mercury would be the alluvial sediment itself, and in particular the fine-grained sediments which could include clay particles with adsorbed mercury. It should be noted that sediments below the groundwater table have been exposed to groundwater. It is possible that low oxygen levels and the presence of anaerobic bacteria within the groundwater may have resulted in some previous methylation of inorganic mercury within the aquifer over time.

Discharge of fines from the aggregate processing plants to the mined areas as part of reclamation would increase the percentage of fine-grained sediment in the reclaimed lakes. The fine-grained sediments generated from processing of aggregate from off-channel mining areas would be expected to have mercury concentrations similar to those in the deposits forming the bottom and sides of the lakes. Processing fines generated from aggregate mined from the active Cache Creek channel may contain relatively higher mercury concentration; these young deposits may be affected by increased available mercury due to historic mining operations within the watershed. Although the OCMP requires flood protection for the proposed mining areas, additional input of sediment to the lakes could occur during infrequent discharges of Cache Creek flows into the pits during floods exceeding the 100-year event. Minor inputs of mercury from precipitation and atmospheric fallout could also be expected.

The potential increased conversion of inorganic mercury to methylmercury as a consequence of development of anaerobic conditions within lakes formed in proposed mining areas is a possible impact. Increased production of methylmercury could have a significant impact on aquatic life within the lakes. Bioaccumulation of methylmercury within fish inhabiting the lakes could present health effects to people consuming these fish. The Food and Drug Administration set the threshold level of methylmercury in fish consumed by humans at 1.0 mg/kg. However, the National Academy of Science recommends a level of 0.5 mg/kg. Although methylation of mercury could occur in other aquatic environments within the Cache Creek system, including wetland areas, potential production of methylmercury in lakes formed in mining areas would be a significant environmental impact related to activities under the proposed OCMP.

Draft OCMP and Implementing Ordinances

Under the OCMP, off-channel mining would be encouraged over in-stream mining. The result of implementing the OCMP would be an increased number of wet pits in the planning area. Five off-channel long-term mining applications have been submitted to the County for review under the OCMP. Of the 2,256 acres proposed for mining in these applications, roughly 84 percent would be wet pit mines and the remainder would be dry pit mines. This would result in long-term exposure of wet pits at numerous locations (11 pits covering 771 acres at completion of reclamation).

The OCMP contains Goals and Performance Standards designed to address potential long-term impacts to groundwater quality associated with permanent wet pits:

Goal 3.2-2: Maintain the quality of surface and groundwater so that nearby agricultural productivity and available drinking water supplies are not diminished.

This Goal, with regard to potential long-term water quality impacts, is supported by Performance Standards 2.5-8, 2.5-18, 3.5-10, and 3.5-11.

PS. 2.5-8: Unnecessary personnel shall be excluded from off-channel excavations. Open pits shall be fenced with a four strand barbed wire fence or the equivalent, prior to the commencement of excavation. Fencing may enclose the property of which mining is a part, the mining site, or both. In addition, signs shall be installed at the project site boundaries and access road, indicating that the excavation area is a danger zone.

This Performance Standard may not provide adequate protection of water quality. Additional security measures at the gates would further deter vehicular access to the wet pits, minimizing potential impacts associated with illegal dumping.

PS. 2.5-18: All final reclaimed slopes shall have a minimum safety factor equal to or greater than the critical gradient as determined by an engineering analysis of the slope stability. Final slopes less than five (5) feet below groundwater shall be designed in accordance with the reclaimed use. Reclaimed wet pit slopes located five (5) feet or more below groundwater level shall not exceed 1:1 (horizontal:vertical), in order to minimize the effects of sedimentation and biological clogging on groundwater flow and to prevent stagnation.

The appropriateness of slope steepness with regards to slope stability is discussed in Impact 4.3-2 of this EIR. Steep slopes would reduce the effects of sedimentation and clogging (relative to gentler slopes), and would tend to reduce the likelihood of stagnation and eutrophication of the wet pit lakes.

PS. 3.5-10: The use of motorized watercraft on any pond, lake, or other water body created as part of the approved reclamation plan is prohibited.

This Performance Standard is not adequately specific regarding whether motorized watercraft on lakes would be permitted during mining, or whether electric-powered watercraft would be permitted.

PS. 3.5-11: The use of off-channel wet pits for the storage and treatment of sewage effluent, or for landfill purposes, is prohibited.

This Performance Standard would minimize adverse impacts to hydrology and/or water quality.

Alternative 1a - No Project (Existing Conditions)

Under this alternative, mining would continue in a manner similar to current practices. The majority of aggregate within the planning area is currently extracted from within the Cache Creek channel. However, several off-channel mining operations are currently permitted. Potential impacts to water quality resulting from current mining operations have been evaluated under previous CEQA review.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

The impacts for this alternative would be similar to those of Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. The potential for local long-term water quality degradation associated with new wet pits would be eliminated.

Alternative 3 - Plant Operation Only (Importation)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. The potential for long-term water quality degradation associated with new wet pits would be eliminated. Operation at the processing plants could continue and chemical release could occur at those locations. However, processing plants are generally located at some distance from open water bodies and established surface water courses, and therefore would not pose a significant threat to regional groundwater quality. In addition, processing plant operations are required to maintain and implement a Storm Water Pollution Prevention Plan to reduce or eliminate impacts to surface water quality

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Under this alternative no new off-channel wet pits would be created, and therefore the potential for long-term water quality degradation associated with new wet pits would be eliminated. However, under this alternative, much of the unsaturated zone would be removed during excavation, reducing the effectiveness of the soil buffer in mitigating chemical releases to the surface.

Alternative 5a - Decreased Mining (Restricted Allocation)

Under this alternative, off-channel mining would be encouraged over in-stream mining. The result of implementing this policy would be an increased number of wet pits in the planning area, potentially impacting groundwater quality.

Alternative 5b - Decreased Mining (Shorter Mining Period)

The impacts for this alternative would be similar to those of the OCMP Alternative.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Under this alternative, permanent wet pit lakes would not be permitted; a minimum of 80 percent of all mined lands would be reclaimed to agriculture. It is likely that under this requirement, numerous temporary wet pits would be created during mining and backfilled during the reclamation period. Up to 20 percent of the mined areas could be reclaimed as wet pits. Therefore, potential long-term water quality impacts associated with permanent wet pits could occur.

Mitigation Measure 4.4-3a (OCMP, A-5a, A-5b, A-6)

In addition to the policies included in the OCMP, the following mitigation measures shall be implemented to reduce potential impacts associated with backfilled pits.

The potential for eutrophication and biological degradation of wet pit lakes would be adequately mitigated by Performance Standards 2.5-18 and 3.5-11, and Mitigation Measure 4.4-2a.

The potential for illegal discharges to occur would be adequately mitigated by Mitigation Measure 4.4-2a.

The potential for water quality degradation resulting from legal operation of motorized watercraft is adequately mitigated by Performance Standard 3.5-10. The potential impacts associated with illegal operation of watercraft in the lakes is adequately mitigated by the requirement for fencing and locked gates, discussed above (Performance Standard 2.5-8).

The potential impacts associated with groundwater quality degradation would be partially mitigated by implementation of the monitoring program described in Mitigation Measure 4.2-2. In addition, the following Performance Standard shall be added to the OCMP and implementing ordinance:

Overburden and processing fines shall be used whenever possible to support reclamation activities around reclaimed wet pits. These materials may be used in reclamation activities without testing for agricultural chemicals. If topsoil (A-horizon soil), formerly in agricultural production, is proposed for use within the drainage area of a wet pit, the soils must be sampled prior to *placement and analyzed for pesticides and herbicides (EPA 8140 and 8150). Samples shall be collected and analyzed in accordance with EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, Third Edition (as updated). Topsoil that contains pesticides or herbicides above the Maximum Contaminant Levels for primary drinking water (California Code or Regulations) shall not be placed in areas that drain to the wet pits.*

The following performance standards shall be added to the OCMP to mitigate the potential for significant adverse impacts associated with the conversion of mercury occurring within Cache Creek alluvial deposits to methylmercury:

Prior to approval of reclamation of aggregate mining areas to permanent lakes, the County shall commission a sampling and analysis program, to be implemented in one existing wet pit mining area within the OCMP planning area, to evaluate the potential for increased methylmercury production associated with wet pit mining and reclamation of mining areas to permanent lakes. The program shall include sampling of water and sediments from the bottom of the existing pit and analysis of the samples for organic content, pH, dissolved oxygen content, dissolved carbon content, and total mercury. In addition, samples of predatory fish (preferably, largemouth bass) shall be collected and analyzed for mercury and methylmercury content. If the initial sampling indicates either of the following conditions, the County shall perform verification sampling:

- *Average concentrations of total mercury in excess of 0.000012 mg/l in the water;*
- *Mercury levels in fish samples in excess of 0.5 mg/kg.*

If verification sampling indicates exceedance of these mercury standards, the County shall not approve reclamation of mining areas to permanent lakes.

In the event of approval of reclamation of mined areas to permanent lakes, the first lake reclaimed as part of each approved long-range mining plan shall be evaluated annually by the landowner for five years for conditions that could result in significant methylmercury production. The annual evaluations shall be conducted by a qualified aquatic biologist or limnologist and shall include the following analyses:

- *Lake condition profiling during the period June through September, including measurements of pH, eH (or redox potential), temperature, dissolved oxygen, and total dissolved carbon.*
- *Collection of a minimum of five predator fish (preferably largemouth bass) specimens and analysis of the specimens for mercury and methylmercury content.*

If the average fish specimen mercury content exceeds 0.5 mg/kg for two consecutive years, wet pit mining on property controlled by the mining operator/owner shall be suspended and the owner/operator shall either:

- *Present a revised reclamation plan to the Yolo County Community Development Agency which provides for filling reclaimed lake to a level five feet above average seasonal high groundwater level with a suitable backfill material, or*

- *Present a mitigation plan to the Yolo County Community Development Agency which provides a feasible and reliable method for reducing methylmercury production. Potential mitigation could include permanent aeration of bottom levels of the lake, alteration of water chemistry (increasing pH or dissolved organic carbon levels), or control of anaerobic bacteria populations. The mitigation plan would require approval by the Regional Water Quality Control Board, Department of Fish and Game, and the Yolo County Department of Environmental Health.*

Implementation of these mitigation measures would reduce this potential impact to a less-than-significant level for the OCMP and Alternatives 5a, 5b, and 6.

Mitigation Measure 4.4-3b (A-1a, A-1b, A-2, A-3, A-4)

None required.

Current projects under Alternatives 1a and 1b would continue under existing approvals (no impacts). Alternatives 2, 3, and 4 would generate no new wet pits, and therefore mitigation would not be required.

Impact 4.4-4
Loss of Water from Aquifer Storage Due to Evaporation

Water continuously moves through the hydrologic cycle; either from the subsurface to the atmosphere through evaporation and evapotranspiration or from the atmosphere to the subsurface as precipitation/infiltration. In general, when it is not raining, moisture moves from the subsurface to the atmosphere through evaporation and evapotranspiration. In addition to water naturally being exchanged through the hydrologic cycle, groundwater and surface water are used for irrigation of crops. In the planning area, the crops are irrigated by both surface water and groundwater.

Impacts of evaporative losses from a wet pit lake are typically evaluated by comparing such losses with historic evapotranspiration losses from agricultural crops. The annual evaporation rate from an open water surface in the vicinity of the planning area is estimated to be 3.92 feet per year (DWR, 1975) (Table 4.4-1). Annual evapotranspiration rates for crops typically grown in the area range from 0.95 foot/year to 3.64 feet/year (Table 4.4-1). However, the presence of wet pits could provide valuable habitat. Water in the Cache Creek system has several designated beneficial uses as described in the Basin Plan (RWQCB, 1991) including agriculture, drinking water, and habitat support.

Draft OCMP and Implementing Ordinances

Implementation of the OCMP would result in the creation of numerous permanent wet pits within the planning area. Based on the mining and reclamation plans proposed under the five long-term applications currently under review by the County, the total wet pit surface area that would be created in the next 30 years would be approximately 771 acres. Annual losses of groundwater from these wet pit surfaces is estimated at 3,022 acre-feet per year, based on a rate of 3.92 feet/year. This apparent loss would be reduced by the amount of precipitation that does not run off[21] (average runoff is 2.5 inches per year (Rantz, 1974)).

[21]Precipitation that does not run off stays within the basin as soil moisture (used by plants) or groundwater recharge. Under existing conditions, 16.5 inches of the average 19 inches of rainfall remain in the basin. The 2.5 inches that would typically run off under existing conditions would be captured by the proposed wet pits. This would reduce the net loss of water from storage due to evaporation from the pits by 161 acre-feet.

Therefore the net loss of water due to evaporation associated with the wet pits is estimated to be 2,861 acre-feet per year (3.71 feet/year from lakes, 5.21 feet/year from wetland habitat). The potential impact associated with the loss of 2,861 acre-feet of water per year may be mitigated by the creation of valuable wildlife habitat in the open water lake areas.

The OCMP contains policies designed to address potential adverse impacts associated with wet pits, including:

Action 3.4-1: Consider evapotranspiration losses as an acceptable result of exposed groundwater, when reclaimed shallow wet pit areas are included as a part of proposed riparian habitat or recreational facilities.

Under this policy, the County designates habitat support as an acceptable use of groundwater. Upon completion of proposed mining, annual evaporation losses from wet pits are estimated at 2,861 acre-feet per year. This is a less-than-significant impact.

PS. 3.5-12: Reclaimed wet pits shall minimize shallow depths in order to reduce evapotranspiration, unless the shallow areas are being reclaimed to wetland habitat. Wet pits shall be considered shallow when they extend less than ten (10) feet into the groundwater table.

This Performance Standard attempts to balance the contradictory objectives of minimizing evaporation losses and creation of valuable habitat. Steep-sided wet pits provide little riparian habitat value, but reduce evaporative losses relative to shallow wet pits. Creation of valuable habitat would be required to mitigate this potential impact. However, implementation of this performance standard would not reduce loss of groundwater to evaporation.

Water is lost to the atmosphere (evapotranspiration) and from open water wet pit lakes (evaporation). Open pit lakes will eventually support valuable wildlife habitat. Both agriculture and habitat are described as designated beneficial uses of water in the Basin Plan (1991).

<u>Alternative 1a - No Project (Existing Conditions)</u>

Under this alternative, mining would continue in a manner similar to current practices. The majority of aggregate within the planning area is currently extracted from within the Cache Creek channel. However, one off-channel wet pit is currently permitted. Potential impacts resulting from evaporative losses from current mining operations have been evaluated under previous CEQA review.

<u>Alternative 1b - No Project (Existing Permits and Regulatory Condition)</u>

Same as Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Under this alternative mining would be discontinued within the planning area and no new off-channel wet pits would be created. No evaporative losses would occur locally under this alternative beyond those that would occur at permitted mining and reclamation sites.

Alternative 3 - Plant Operation Only (Importation)

Same as Alternative 2.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Under this alternative no new off-channel wet pits would be created. No additional evaporative losses would occur under this alternative.

Alternative 5a - Decreased Mining (Restricted Allocation)

Under this alternative, off-channel mining would be encouraged over in-stream mining. The result of implementing this policy would be an increased number of wet pits in the planning area, resulting in increased evaporative losses. This is a potentially significant impact.

Alternative 5b - Decreased Mining (Shorter Mining Period)

Same as OCMP Alternative.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Under this alternative new permanent off-channel wet pits would be limited to 20 percent of the total reclaimed area. Evaporative losses during mining, prior to reclamation as agricultural land, and from the permanent lakes would occur. This is a potentially significant impact.

Mitigation Measure 4.4-4a (OCMP, A-5a, A-5b, A-6)

None required.

Performance Standard 3.5-12 of the OCMP should be modified as follows:

> *~~Reclaimed wet pits shall minimize shallow depths in order to reduce evapotranspiration, unless the shallow areas are being reclaimed to wetland habitat. Wet pits shall be considered shallow when they extend less than ten (10) feet into the groundwater table.~~ All permanent wet pits shall be reclaimed to include valuable wildlife habitat.*

Implementation of this mitigation measure would reduce this impact to a less-than-significant level for the OCMP and Alternatives 5a, 5b, and 6.

Mitigation Measure 4.4-4b (A-1a, A-1b, A-2, A-3, A-4)

None required.

Current mining projects under Alternatives 1a and 1b would continue under existing approvals (no impact). Alternatives 2, 3, and 4 would generate no impact associated with evaporative losses, and therefore mitigation would not be required.

Impact 4.4-5
Potential Impacts Associated with Groundwater Recharge

It may be possible to use former mining areas (dry pits and future wet pits may be created) as recharge basins as part of a groundwater recharge system. However, the creation of wet pits alone provides no recharge benefits; the presence of the pits results in a net loss of groundwater from the aquifer, since evaporation rates exceed rainfall in the planning area. In addition, recharge would not be achieved by pumping groundwater into the pits, since this would result in removing groundwater from storage while simultaneously replenishing it. Recharge could be achieved by diverting surface water from irrigation canals and/or creeks into the pits.

Management of groundwater and surface water supplies and transfers is the primary responsibility of the Yolo County Flood Control and Water Conservation District (YCFCWCD). A water management plan has not been completed by YCFCWCD at this time. It is therefore unknown whether the wet pit lakes would be compatible with the goals of a YCFCWD water management plan.

OCMP and Implementing Ordinances

The OCMP and associated Technical Studies provide insufficient information on the use of former mining areas as groundwater recharge facilities to allow for adequate analysis of associated potential environmental impacts. The OCMP contains policies regarding the use of former mining areas as recharge facilities. However, a water management plan has not been prepared as part of the project, and therefore cannot be evaluated in this EIR. The intent of the County to cooperate and coordinate with the YCFCWCD is an appropriate goal; however, the OCMP should not attempt to design or mitigate potential environmental impacts associated with a groundwater recharge program that has not been completed. The following policies regarding groundwater recharge are included in the OCMP:

Goal 3.2-1: Promote the conjunctive use of surface and groundwater to maximize the availability of water for a range of uses, including habitat, recreation, agriculture, water storage, flood control, and urban development.

Obj. 3.3-1: Encourage the development of a Countywide water management program, including the participation of the YCFCWCD and other relevant agencies, to coordinate the monitoring and analysis of both surface and groundwater supplies.

Obj. 3.3-3: Improve the recharge capability along Cache Creek through the development of off-channel ponds, lakes, and canals that have the ability to raise local groundwater levels.

Action 3.4-2: Coordinate with the Yolo County Flood Control and Water Conservation District in developing an integrated groundwater recharge plan for Cache Creek, in order to increase the available groundwater supply for municipal and agricultural uses. When it is intended that reclaimed off-channel excavations be used as a part of the recharge plan, the County shall consider the siting and design requirements needed to accommodate the District's requirements.

Action 3.4-6: Locate groundwater management facilities in accordance with the Recommended Management Activity Zones described in the Technical Studies. Groundwater recharge basins shall be concentrated in Zone 4.

Action 3.4-7: Encourage the transfer of sediment fines generated by aggregate processing from mining operations located in areas recommended for groundwater recharge (Zone 4 in the Recommended Management Activity Zones described in the Technical Studies) to areas where groundwater enhancement is less favorable, especially Zone 3. This would reduce the impacts associated with backfilling in areas where recharge efforts are emphasized.

Action 3.4-8: Develop groundwater recharge basins in Zone 4 of the Recommended Management Activity Zones described in the Technical Studies. Said basins should be situated at least ten feet above the groundwater level, with relatively flat pit floors that are easily accessible by maintenance equipment.

PS. 3.5-7: Off-channel excavations that will be reclaimed to recharge basins shall maintain a minimum ten (10) foot unsaturated zone below the pit floor, in order to allow for groundwater mounding and provide maintenance opportunities.

PS. 3.5-14: Reclamation plans including proposed ponds, lakes, or other bodies of water shall be referred to the Yolo County Flood Control and Water Conservation District and the Mosquito Abatement District for review and comment prior to approval.

PS. 3.5-15: If any off-channel excavations are proposed to be reclaimed to water recharge facilities, then prior to the commencement of excavation below the water table, the applicant shall demonstrate in a manner consistent with the Technical Studies that the recharged water will not be discharged into a gaining reach of Cache Creek.

Alternative 1a - No Project (Existing Conditions)

A water management plan has not been completed, and therefore cannot be evaluated in this EIR. Potential impacts associated with the use of former mining areas as recharge facilities would be subject to CEQA review after a water management plan has been completed.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

Same as Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Same as Alternative 1a.

Alternative 3 - Plant Operation Only (Importation)

Same as Alternative 1a.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Same as OCMP.

Alternative 5a - Decreased Mining (Restricted Allocation)

Same as OCMP.

Alternative 5b - Decreased Mining (Shorter Mining Period)

Same as OCMP.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Same as OCMP.

Mitigation Measure 4.4-5a (OCMP, A-4, A-5a, A-5b, A-6)

The County shall eliminate the following Actions and Performance Standards from the OCMP: Objective 3.3-3, Actions 3.4-2, 3.4-6 through 3.4-8, Performance Standards 3.5-7, 3.5-9, 3.5-14, and 3.5-15.

Implementation of the mitigation measures would eliminate potential impacts associated with coordination with a separate undefined project.

Mitigation Measure 4.4-5b (A-1a, A-1b, A-2, A-3)

None required.

Impact 4.4-6
Potential Impacts Resulting from Storm-Related Flooding

In most of the upstream portions of the planning area (west of Road 94B), the existing configuration of the Cache Creek channel has the capacity to convey the 100-year storm (NHC, 1995). In several locations downstream (east of Road 94B), the Cache Creek channel cannot contain 100-year flows. Portions of the planning area are also subject to flooding from local runoff and overflows from smaller tributaries, including Lamb Valley Slough and Willow Slough.

<u>Draft OCMP and Implementing Ordinances</u>

Implementation of the OCMP would encourage off-channel mining rather than in-channel mining. If in-channel mining were eliminated or reduced to levels below the rate of replenishment, sand and gravel would begin to accumulate in the channel, reducing flood storage volume and conveyance. Without intervention (maintenance mining within the channel or heightening levees), the channel would eventually aggrade to the level where 100-year flood protection of the mining areas would be lost.

Completion of all the mining and reclamation proposed by the five long-term applications submitted to the County would result in the creation of numerous internally-drained lowered surfaces. This would, in effect, remove a portion of the contributing drainage area to Cache Creek and result in an incremental reduction in the base flood elevation. However, since the total area to be mined is only 2,211 acres (3.45 square miles) and the Cache Creek drainage basin has a watershed area of 1,140 square miles, the 0.3 percent reduction in drainage area is expected to have very little impact on regional flooding.

The OCMP contains policies designed to address potential adverse impacts associated with wet pit lakes, including:

Goal 4.2-1: Recognize that Cache Creek is a dynamic stream system that naturally undergoes gradual and sometimes sudden changes during high flow events.

This Goal is supported by Actions 4.4-2, 4.4-3, and 4.4-6.

Goal 4.2-2: Coordinate land uses and improvements along Cache Creek so that the adverse effects of flooding and erosion are minimized.

This Goal is supported by Actions 4.4-1, 4.4-4, and 4.4-5; and Performance Standards 4.5-1 and 4.4-6.

Goal 4.2-3: Establish a more natural channel floodway capable of conveying flood waters without damaging essential structures, causing excessive erosion, or adversely affecting adjoining land uses.

This Goal is supported by Action 4.4-7 and Performance Standard 4.5-7.

Obj. 4.3-1: Provide flood management as required to protect the public health and safety.

It is assumed that this Objective refers to flood management within the planning area since protection of health and safety outside the planning area would be beyond the jurisdiction of the OCMP. Regardless, implementation of this goal may exacerbate existing flooding problems downstream of the planning area. Reducing channel roughness and minimizing backwater effects at essential structures (i.e. bridges) could result in increasing base flood elevations at downstream locations. This Objective is supported by Action 4.4-5 and Performance Standards 4.5-6 and 4.4-7.

Obj. 4.3-2: Determine an approximate flood capacity standard for Cache Creek, so that the extent of a more stable channel configuration may be designed.

This Objective is outside the scope of the OCMP. Existing County Resolution (94-82) requires (and the OCMP would require) that the mining areas are protected from the 100-year flood. This Objective would more appropriately be included in the Cache Creek Resources Management Plan.

Action 4.4-1: Revoke the 1979 In-Channel Mining Boundary, as defined in Section 10-3.303.(a) of the Yolo County Mining Ordinance. In its place, adopt a new in-channel area based on the present channel bank and the 100-year floodplain, as determined by the U.S. Army Corps of Engineers in the Westside Tributaries Study. This is a more accurate measure of delineating the boundary between in-channel and off-channel uses.

The proposed new in-channel boundary incorrectly identifies a portion of the Solano Concrete mining area (south of Cache Creek and east of Interstate 5) as "in-channel." The Solano Concrete mining area is outside the 100-year floodplain and should not be included within the new channel boundary.

Action 4.4-2: Designate the streamway influence boundary described in the Technical Studies as part of the Off-Channel Mining Plan. The boundary describes the general area of the creek subject to meandering, as defined by the historical activities of the channel. The streamway influence boundary also defines the area where in-stream and off-channel issues overlap and are addressed in both plans.

This Action would minimize impacts to hydrology and/or water quality.

Action 4.4-3: Use the data and assumptions provided in the Technical Studies, when evaluating significant modifications to the floodplain. This will ensure a consistent frame of reference and will update the model to account for changing future conditions.

This Action would minimize impacts to hydrology and/or water quality.

Action 4.4-4: Work with other agencies having jurisdiction over Cache Creek including, but not limited to, the Yolo County Flood Control and Water Conservation District, the U.S. Army Corps of Engineers, the State Reclamation Board, and the Federal Emergency Management Agency in developing a coordinated solution for managing flood events throughout the watershed of Cache Creek.

This Action would minimize impacts to hydrology and/or water quality.

Action 4.4-5: Manage activities and development within the floodplain to avoid hazards and adverse impacts on surrounding properties. This shall be accomplished through enforcement of the County Flood Ordinance and ensuring that new development complies with the requirements of the State Reclamation Board.

This Action would minimize impacts to hydrology and/or water quality.

Action 4.4-6: Allow for the design of spillways or other engineered features that provide controlled pit capture during a catastrophic flood event.

This Action is not supported by Performance Standards. Performance Standards are provided below as mitigation measures.

Action 4.4-7: Enter into a Memorandum of Understanding with the Yolo County Flood Control and Water Conservation District to provide a regular source of surface water flow in Cache Creek throughout the year, when annual precipitation is sufficient. The timing and volume of flows should be established consistent with the Technical Studies, in order to create a stable low-flow channel and allow for the natural revegetation of off-channel areas along the creek, where appropriate.

This Action would minimize impacts to hydrology and/or water quality.

PS. 4.5-1: All off-channel surface mining operations shall be provided with a minimum of 100-year flood protection. Off-channel excavations that extend below the existing streambed elevation of Cache Creek shall be designed to minimize the possibility of levee breaching and/or pit capture, except under controlled circumstances.

Specific Performance Standards designed to minimize the possibility of levee failure and/or pit capture are described under Impact 4.3-2.

PS. 4.5-4: Silt basins which store water during periods of surface runoff shall be equipped with sediment control and removal facilities and protected spillways designed to minimize erosion when such basins have an outlet to lower ground and/or Cache Creek.

This Performance Standard is repeated as Performance Standard 2.5-17. Refer to Impact 4.3-2 of this EIR for discussion of siltation basins.

PS. 4.5-5: No wastewater shall be directly discharged to Cache Creek. Sediment fines generated by aggregate processing shall be placed in settling ponds, designed and operated in accordance with all applicable regulations, and used for backfill material in off-channel excavations.

This Performance Standard is repeated as Performance Standard 3.5-8. Refer to Impact 4.4-2 of this EIR for discussion regarding handling of wastewater from processing plants.

PS. 4.5-6: New development (such as buildings, levees, or dikes) located within the floodplain shall conform to all applicable requirements of the Yolo County Flood Ordinance, the Federal Emergency Management Agency (FEMA), and the State Reclamation Board.

This Performance Standard would minimize impacts to hydrology and/or water quality.

PS. 4.5-7: Stormwater drainage systems shall be designed so as to prevent flooding on surrounding properties and County rights-of-way.

This Performance Standard would minimize impacts to hydrology and/or water quality.

Alternative 1a - No Project (Existing Conditions)

Under the existing conditions, off-channel aggregate operations are required to maintain 100-year flood protection for mining and processing areas under Yolo County Resolution 94-82. Existing regulations governing activities within the planning area do not specifically address the potential for exacerbating downstream flooding problems. This alternative could result in impacts to flooding downstream, but those impacts were evaluated by previous CEQA review.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

Same as Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

If existing permits to mine and operate plants were canceled, regulatory authority to enforce maintenance of alluvial separators may be eliminated. Those areas that are currently protected from 100-year floods would continue to benefit from that protection until an overtopping or erosional event compromised the alluvial separator. At that time, it is unlikely that resources for repair of the alluvial separator would be available from the property owner or County. The mining operators have resources (equipment, operators, and knowledge) to conduct repairs to the alluvial separators and slopes, should failures occur. Eliminating the presence of mining operators from the planning area would reduce the likelihood that the separators would be maintained. Without the alluvial separators, floodplain limits would expand. Agricultural fields, homes, and roads, which currently are protected from floods less than the 100-year event, could be inundated during large storms.

Alternative 3 - Plant Operation Only (Importation)

If existing permits to mine and operate the plants were canceled, regulatory authority to enforce maintenance of alluvial separators may be eliminated. Those areas that are currently protected from 100-year floods would continue to benefit from that protection until an overtopping or erosional event compromised the alluvial separator. At that time, it is unlikely that resources for repair of the alluvial separator would be available from the property owner or County. Flooding and erosion of remaining plant sites would be a potentially significant impact.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Same as OCMP.

Alternative 5a - Decreased Mining (Restricted Allocation)

Same as OCMP.

Alternative 5b - Decreased Mining (Shorter Mining Period)

Same as OCMP.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Same as OCMP.

Mitigation Measure 4.4-6a (OCMP, A-4, A-5a, A-5b, A-6)

As discussed previously, the existing configuration of Cache Creek west of Road 94B can convey 100-year flows within its banks. Cache Creek east of Road 94B and the tributaries cannot convey 100-year flows within their banks. Therefore, simply raising levees to contain these flows on lower Cache Creek (east of Road 94B) and the tributaries would likely exacerbate flooding downstream. The following performance standard should be added to the OCMP:

Performance Standard 4.5-8: Flood protection upgrades shall be completed in the vicinity of the mining and processing areas, if necessary, to ensure protection from the 100-year flood event. Flood protection shall be provided from flooding associated with overtopping of the alluvial separators or levees along Cache Creek and all tributaries and drainage channels (including, but not limited to, Willow Slough and Lamb Valley Slough).

The flood protection upgrades shall be designed and constructed to provide the necessary 100-year protection without exacerbating downstream flooding problems. Downstream flooding could be increased if floodplain storage areas were removed from the drainage system by constructing levees in areas where they did not exist before (or raising levees that are overtopped in floods up to the 100-year event). Alternative flood management design systems (potentially using detention basins, infiltration galleries, and/or floodplain storage in noncritical areas) shall be required as a condition of project approval.

The following performance standard should be added to the OCMP:

Performance Standard 4.5-9: The County Floodplain Administrator shall file for a Letter of Map Revision with FEMA, to update the FIRMs affected by channel maintenance activities and levee improvements with the planning area every ten years.

Implementation of these mitigation measures would reduce this impact to a less-than-significant level for the OCMP and Alternatives 4, 5a, 5b, and 6.

Mitigation Measure 4.4-6b (A-1a, A-1b)

None required.

Current mining projects proposed under Alternatives 1a and 1b would continue under existing approvals (less-than-significant impact).

Mitigation Measure 4.4-6c (A-2, A-3)

None required.

If new mining projects were no longer approved within the planning area, protection of new mining areas from the 100-year event would not be relevant. Protection from 100-year floods would only be required for the processing plants as long as they were in operation and until the plant sites were fully reclaimed, as required under existing permits. Alternatives 2 and 3 would generate no new impacts associated with flooding.

Impact 4.4-7
Potential Impacts from Flooding Related to Dam Failure

The planning area could be flooded if the Indian Valley Dam were to fail catastrophically (Borcalli and Associates, 1994). Based on calculations conducted as part of a dam failure analysis, the inundation wavefront would reach the western portion of the planning area at Capay approximately three hours after dam failure. The wavefront would likely reach the eastern portion of the planning area at Yolo approximately seven hours after dam failure. Inundation depths would be expected to range between 4.0 and 17.0 feet.

An Emergency Action Plan (YCFCWCD, 1996) designed to coordinate response to failure of the Indian Valley Dam has been prepared. The plan, to be implemented by the YCFCWCD in case of an emergency, contains specific requirements for notification, evacuation, and surveillance of the hazard or potential hazard. Efficient evacuation of the area should be possible since it would take several hours for the flood water to reach the planning area. Mining within potential dam failure inundation areas is not restricted, and mining within the planning area would not exacerbate existing flooding associated with a dam failure event.

<u>Draft OCMP and Implementing Ordinances</u>

Flooding associated with dam failure is a low probability event that has been addressed by existing requirements by preparation and implementation of an Emergency Action Plan. Dam failure represents a less-than-significant impact, therefore no mitigation is required.

<u>Alternative 1a - No Project (Existing Conditions)</u>

Same as OCMP.

<u>Alternative 1b - No Project (Existing Permits and Regulatory Condition)</u>

Same as OCMP.

Alternative 2 - No Mining (Alternative Site)

Under this alternative, mining would be discontinued within the planning area, and therefore would result in no impact.

Alternative 3 - Plant Operation Only (Importation)

Same as Alternative 2.

Alternative 4 - Shallow Mining (Alternative Method/Reclamation)

Same as OCMP.

Alternative 5a - Decreased Mining (Restricted Allocation)

Same as OCMP.

Alternative 5b - Decreased Mining (Shorter Mining Period)

Same as OCMP.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

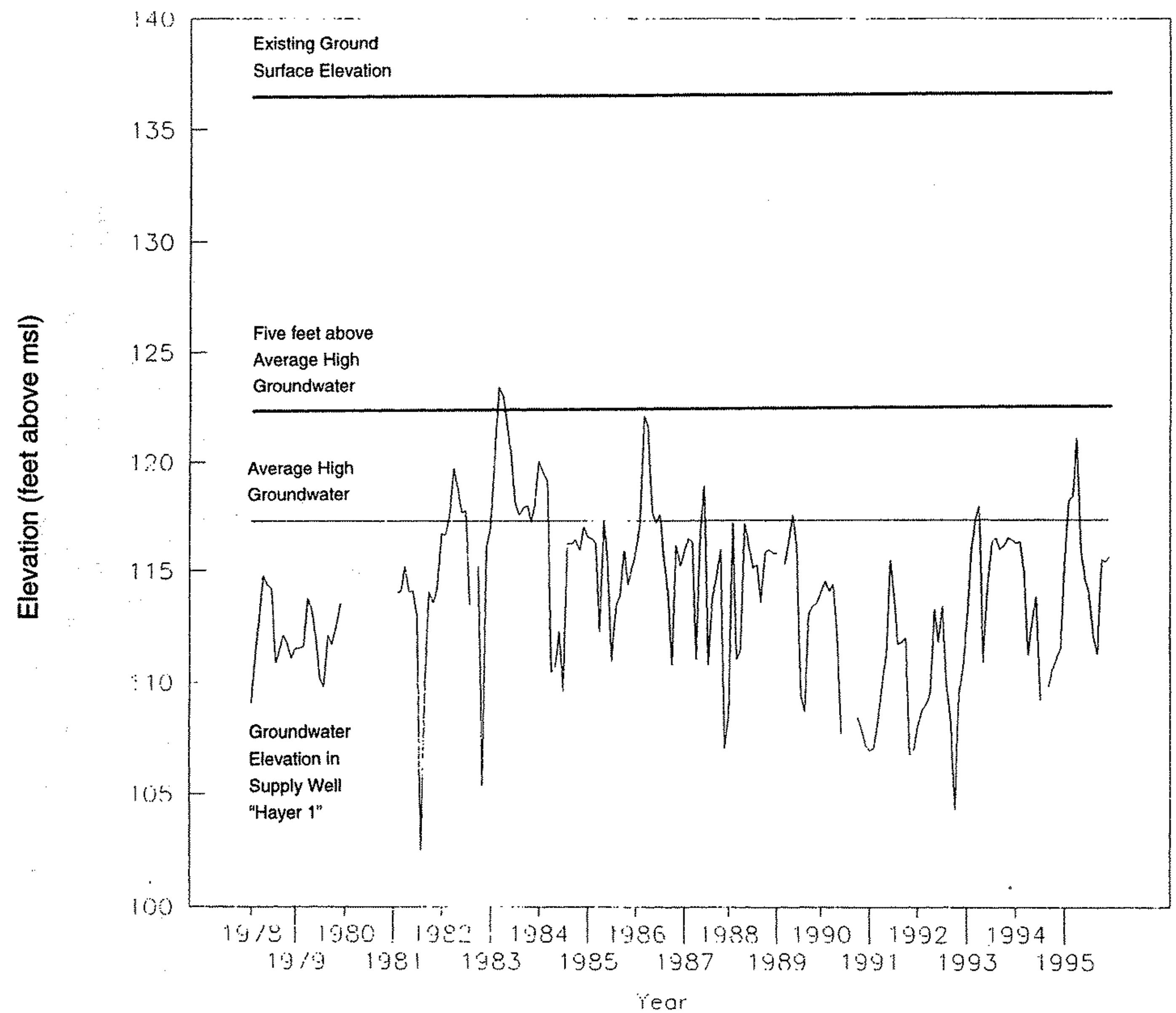
Same as OCMP.

Mitigation Measure 4.4-7a (OCMP, A-1a, A-1b, A-2, A-3, A-4, A-5a, A-5b, A-6)

None required.

Impact 4.4-8
Potential Impacts Associated with Inundation of Dry Pits or Lowered Reclaimed Surfaces by High Groundwater Conditions

Mining and reclamation resulting in the creation of dry pits and/or lowered surfaces may occur within the planning area. Shallow mining areas that do not extend below the water table, or deep wet pit mines backfilled with processing fines and overburden may be reclaimed to lowered agricultural surfaces in compliance with County objectives to preserve agricultural lands. These surfaces may be inundated by high groundwater conditions, causing damage to winter crops and delayed access to fields for planting of high-value summer crops. Under extreme conditions, the reclaimed surface could be rendered unfarmable. Figure 4.4-11 shows the relationship between groundwater level fluctuations measured in one water supply well and the existing ground surface.



Note: This hydrograph is based on monthly water level measurements. Some low groundwater levels (summer) may be affected by a pump operating in the well. Typically pump does not operate in winter. Gaps in the plot reflect missing data.

Figure 4.4-11 Groundwater Level Fluctuations

SOURCE: RUSSO, 1996

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Under this alternative, wet pit and dry pit mining areas may be reclaimed to lowered agricultural surfaces. The distance between the reclaimed surface and the average high groundwater level has not been specified in the OCMP or the associated ordinance. Potential inundation of lowered surfaces would be a significant impact requiring mitigation.

Alternative 1a - No Project (Existing Conditions)

Under this alternative, mining would continue in a manner similar to current practices. The majority of aggregate within the planning area is currently extracted from within the Cache Creek channel. However, off-channel mining is occurring under the existing conditions and would likely continue under this alternative until reserves are exhausted. Short-term mining applications have been approved with the requirement that reclaimed surfaces must be, at a minimum, five feet above average high groundwater level. Reclamation to five feet above average high groundwater represents a less-than-significant impact.

Alternative 1b - No Project (Existing Permits and Regulatory Condition)

Same as Alternative 1a.

Alternative 2 - No Mining (Alternative Site)

Under this alternative, mining would be discontinued within the planning area. Reclamation of the past off-channel mined areas would require reclamation in accordance with approved reclamation plans. Those plans have already been subject to CEQA review. No new lowered surfaces would be created, and therefore no impact would result.

Alternative 3 - Plant Operation Only (Importation)

Same as Alternative 2.

Alternative 4 - Shallow Mining (Alternative Methods/Reclamation)

Under this alternative, mining would be limited to depths no greater than 10 feet above the historic high groundwater elevation. It is unlikely, even during a prolonged storm, that high groundwater levels greater than 10 feet above historic levels would be sustained for an extended period, and therefore represents a less-than-significant impact without mitigation.

Alternative 5a - Decreased Mining (Restricted Allocation)

Same as OCMP.

Alternative 5b - Decreased Mining (Shorter Mining Period)

Same as OCMP.

Alternative 6 - Agricultural Reclamation (with Mining Operations as Proposed)

Same as OCMP.

Mitigation Measure 4.4-8a (OCMP, A-5a, A-5b, A-6)

The following Performance Standard should be added to the OCMP and associated ordinance:

Performance Standard 3.5-16: The final distance between reclaimed lowered surfaces and average high groundwater shall not be less than five feet. The average high groundwater level shall be established for each proposed mining area. The degree of groundwater level fluctuation varies with location throughout the basin and within relatively small areas (proposed mining sites). The determination of average high groundwater level shall be conducted by a professional engineer or certified hydrogeologist and shall be based on wet season water level elevation data collected at the proposed site or adjacent areas with similar hydrogeological conditions. Water level records prior to 1977 should not be used since they would reflect conditions prior to installation of the Indian Valley Dam. The dam caused a significant change in hydrology of the basin and data collected before its installation should not be used in estimation current average high groundwater levels. The newly installed or existing wells should be adequately distributed throughout the proposed mining site to reflect spatial variation in groundwater levels and fluctuations.

Implementation of this implementation measure would reduce the impact to a less-than-significant level for the OCMP and alternatives 5a, 5b and 6.

Mitigation Measure 4.4-8b (A-1, A-2, A-3, A-4)

None required.

Current mining projects under Alternatives 1a and 1b would continue under existing approvals (no impact). No mining, and therefore no impact, would occur under Alternatives 2 and 3. Alternative 4 adequately mitigates this potential impact.